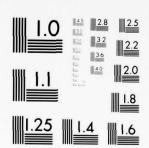


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NADC-77-107-30 - VOL - 2 LIFT SYSTEM INDUCED AERODYNAMICS OF V/STOL AIRCRAFT IN A MOVING DECK ENVIRONMENT. **VOLUME II, STATIC AND DYNAMIC JET-INDUCED** FORCE AND MOMENT DATA. McDonnell Aircraft Company McDonnell Douglas Corporation James H. Kamman P.O. Box 516 Charles L. / Hall St. Louis MO. 63166 29 Septemb Final Report for Pariod 30 September 1977 - 29 September 1978 N62269-77-C- \$365 Approved for Public Release: Distribution Unlimited Prepared for 403111 **NAVAL AIR DEVELOPMENT CENTER** 

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Ground Effects						
Suckdown Fountain Forces						
Ship Motion Effects						
20. ABSTRACT (Continue on reverse side if necessary and	identify by block number					
The propulsive lift system ind		s of multi-jet V/STOL air-				
craft configurations were experimen	tally evaluated	over a moving deck and at				
static hover conditions. Several me	odel configurati	ons representative of ad-				
vanced subsonic and supersonic V/ST	OL aircraft were	tested.				
212		obtained for beauting nitet				
Dynamic jet-induced force and ing, and rolling motions of a simulation	moment data were ated seaborne la	inding platform over a range				

20. (Cont'd)

of heights, amplitudes, and frequencies. Configuration effects were assessed at both static hover and deck motion conditions, including the effects of wing height, fuselage contouring, lift improvement devices, and nozzle arrangement. In addition, tests were performed to separate the effects of deck motion on the fountain impingement forces. Empirical procedures were defined to aid in predicting the dynamic jet-induced forces and moment variations with deck motion.

Configuration design and model testing guidelines for V/STOL aircraft are described. Recommendations are also made for further research to provide additional information required to develop generalized prediction procedures.



#### FOREWORD

An investigation was conducted for the Naval Air Development Center (NADC) by McDonnell Aircraft Company (MCAIR) to assess the propulsive lift system induced aerodynamics of V/STOL aircraft over a moving deck. The study was performed under Navy contract N62269-77-C-0365 with Mr. M. M. Walters of NADC as contract monitor. The MCAIR efforts in this program were accomplished under the direction of Mr. J. H. Kamman with Mr. C. L. Hall as principal investigator, both of the MCAIR Propulsion Department.

The authors are particularly indebted to Mr. J. D. Flood for his effort involved in the test program preparations and to Mr. K. P. Connolly for his assistance during the data reduction and report preparation. Special acknowledgements are due Mr. H. Sams, Dr. E. D. Spong, and Mr. R. E. Owen for their contributions.

This report consists of two volumes. The technical discussion including the test program description, data analyses results, conclusions and recommendations are presented in Volume I. Appendix A, Test Run Summary, Appendix B, Static Induced Aerodynamic Data, and Appendix C, Induced Aerodynamic Data in Time and Frequency Domains are given in Volume II.

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#### LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Total combined exit area of all nozzles AT Wing span, inches or cm. Mean aerodynamic chord length, inches or cm. **CFAS** Non-dimensionalized induced axial force coefficient based on static gross thrust **CFNS** Non-dimensionalized induced lift coefficient based on static gross thrust Non-dimensionalized induced side force coefficient based on CFYS static gross thrust **CPMS** Non-dimensionalized induced pitching moment coefficient based on static gross thrust CRMS Non-dimensionalized induced rolling moment coefficient based on static gross thrust CSD Cross power spectral density statistical function **CYMS** Non-dimensionalized induced yawing moment coefficient based on static gross thrust D Dynamic deck motions - describes the type of run Di Exit diameter of each nozzle, inches or cm. Equivalent nozzle exit diameter based on the total areas of all nozzles, inches or cm Nozzle reference dimension = 4.024 inches (10.221 cm) D<sub>Ref</sub> f Frequency, Hz F Front Induced axial force ΔFA Total static gross thrust of the nozzle exhaust flow  $F_{G}$ Thrust bias ratio F<sub>GFRONT</sub>/  $F_{G_{TOTAL}}$ Induced side force  $\Delta$ FY FS Full scale

#### LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS (Continued)

H Model nozzle height above the deck, or the distance of the nozzle exit plane above the neutral point of the moving deck, inches or cm

h Heaving amplitude, inches or cm

Hz Hertz, cycles per second

LID Life Improvement Device

ΔL Induced lift force acting on the airframe

MS Model scale

NPR Nozzle pressure ratio, P<sub>ti</sub>/P<sub>amb</sub>

P Ambient pressure

ΔPM Induced pitching moment, in-lb<sub>f</sub> or kg-cm

PSD Power Spectral Density statistical function

P<sub>t</sub>; Nozzle exhaust total pressure, 1b<sub>f</sub>/in<sup>2</sup> or kg/m<sup>2</sup>

R Rear

ΔRM Induced rolling moment, in-lb<sub>f</sub> or kg-cm

S Static conditions - describes the type of run

 $\Delta YM$  Induced yawing moment, in-lb<sub>f</sub> or kg-cm

t Time, seconds

T Period of one cycle, seconds

α Deck pitch angle, degrees

Deck roll angle, degrees

τ Lag time, seconds

Phase angle between pitch and roll or other combined deck motions, degrees

#### SUMMARY

In ground effect, the propulsive lift system induced aerodynamics experienced by V/STOL aircraft can significantly degrade the aircraft lift capability as well as the stability and control. In addition, for operations at sea, the ship motion will cause fluctuations in these induced forces and moments.

To investigate these effects, the induced aerodynamics of multi-jet V/STOL aircraft configurations were experimentally evaluated in the dynamic environment of a moving deck as well as at static hover conditions. A variety of model configurations representative of advanced subsonic and supersonic V/STOL aircraft were tested in the MCAIR Propulsion Subsystem Test Facility utilizing the Jet Interaction Test Apparatus and Deck Motion Simulator.

Dynamic effects were assessed for heaving, pitching, and rolling motions of the deck over a range of deck heights, amplitudes, and frequencies. Further, the dynamic data were analyzed statistically to determine the frequency content and phase relationships between the deck motions and the aerodynamic responses. Several configuration effects were also assessed in the test program including the effects of wing height, fuselage contouring, lift improvement devices, and nozzle arrangement. Empirical procedures were defined to aid in predicting the dynamic jet-induced forces and moments resulting from deck motion. In this effort, comparisons were made between predictions based on static hover data and the actual dynamic response data.

Significant results relating primarily to the effects of deck motion are summarized below:

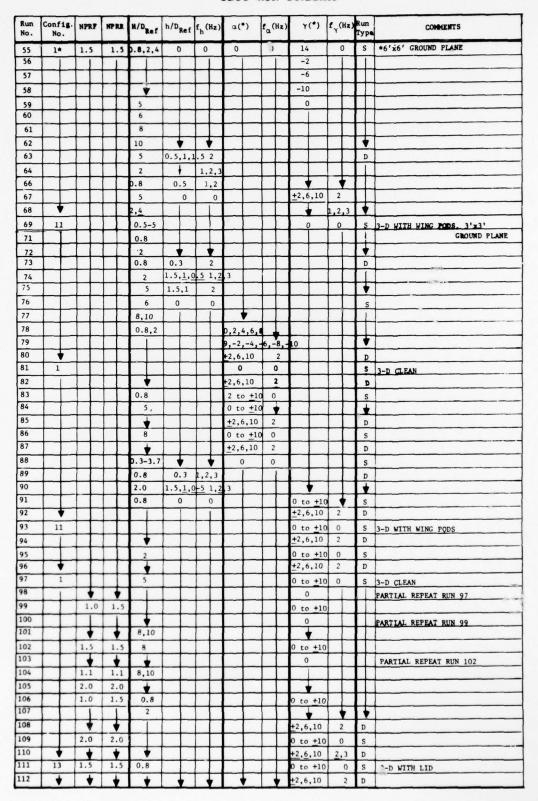
- o The responses of the jet-induced force and moment data to deck motion are of a complex periodic nature at the same and/or multiples of the deck motion frequency.
- o The force and moment variations predicted from static hover data can differ significantly from the actual dynamic data particularly for combined motions (e.g., heave and roll).
- o Simulation of the model lower surface contouring is important, particularly in the fountain impingement region.
- o The induced lift resulting from fountain impingement increases as the deck heaves toward the model.
- o The fountain appears to have the largest impact on the force and moment variations with deck motion.

- o For a configuration with high suckdown in ground effect, an increase in lift loss occurs when the deck heaves away from the model.
- o The deck motion frequency has little effect on the statistical aerodynamic response but can affect the instantaneous response characteristics.
- o Properly designed LID's can significantly enhance the induced lift even at substantial deck roll angles.

Configuration design and model testing guidelines for V/STOL aircraft are described based upon the data obtained in this program. Recommendations are also made for further research to extend the empirical data base and to provide additional information required to develop generalized prediction procedures.

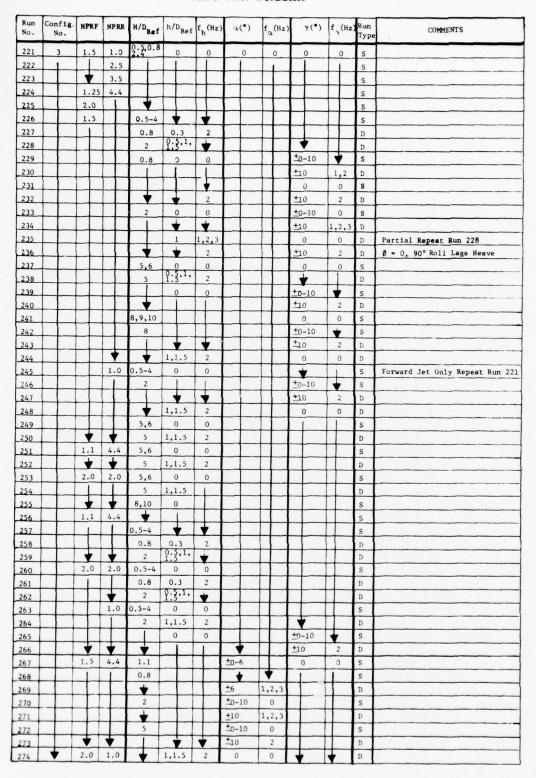
APPENDIX A TEST RUN SUMMARY

Run No.	Config.	NPRF	NPRR	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	f <sub>a</sub> (Hz)	Υ(*)	f (Hz)	Run Type	COMMENTS
1	1	1.5	1.5	n 5-4	0	0	0	0	0	0	S	3-D CLEAN, 3 JET SUBSONIC
2	1			0.8, 2					+2		1	V/STOL WITH 3' x 3' GROUND PLAN
3									4			NOTE: RUNS 1-69 PITCH ANGLE
4									6			VARIES WITH HEIGHT (0° to +2
5									8			
6									10			
7				0.8,2,4					14			
8							+		-10			
9							+2		0			
10							4	11			$\perp$	
11		-	1	1-	-		6	1			1	
12	-	-	++	1	-	1	8	1		1	1	
13		-	++-	$\vdash$	$\vdash$		10	++			1	
14	-	-	-	$\vdash$	-		-2	444		-	1	
15		-	-	-		-	0			-	1	PARTIAL REPEAT RUN 1
16		-	-	-	-		-4	+		++-	+	
	-	-	-	-	-	-	-6	+++	-		+	
18		+	1		-	++-	-8 -10	++-			+	
20	++-			<del>      -</del>	-	++-		+++			+	
21	++-		9 1.5			++-	0	+++	-	++-	-	
22	+-+-	1.1-1	1.5	5	-	++-		+++	-	++-	+	NOZZLE PRESSURE BIAS
23	+-+-	1.5	1.5	6	-	++-		+++		-	+	
24	++-	-	++-	8	-	+++		++-		+++	$\vdash$	
25	-	++-	++-	10	-	+++		+++		++-	$\vdash$	
26		1		5	++-	++-		++-	-	++	+	
27						+++	-	+++		+++	+	
28				1		+++		111		1	1	
29			1-1-	8		+				+	$\vdash$	
30											$\vdash$	
31				1		++						
32				4								
33				+								
34				2								
35				+								
36				5								
37				2								
38	*			0.8							*	
39	1*			0.5-4			*				S	*6'x6' GROUND PLANE
40	-			0.8,2,4			+2				1	
41		-					4					
42							6					
43		-					8				4	
44		-	-				10	1	-		1	
45		-	-				-2				1	
46		-	-		-		-4	-			1	
47							-6	+		-	-	
48	-	+	-		-		-8				-	
49		-	-				-10	+	•		+	
50		-					0		+2	-	+	
51	-	++	-		_				4	-	1	
52	-	+	-		-			++-	6		1	
53		+							8			



Run No.	Config.	NPRF	NPRR	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	fa(Hz)	Y(*)	f <sub>Y</sub> (l	iz)Run Type	COMMENTS
113	13	1.5	1.5	2	0	0	0	0	0 to +1	0 0	S	3-D with LID
114	•		•						+2,6,10	2	D	
115	1		1.0	0.5-4					0	0	S	3-D Clean
116	L	1.0	1.5	+							S	
117		*	•	2	1.5	2					D	
118		1.1	1.1	0.5-4	o o	0				T	S	
119		+	+	0.8	+						S	
120		1.1	1.1	2	.5,1,1.5						D	
121		2.0	2.0	0.5-4	0	0					S	
122				0.8	0.3	2					D	
123			•	2	0.5, 1,1.5	+	*			$\Box$	D	
124		1.0	1.5	0.8	0	0	+2 -10				S	
125				2							S	
126			-	5	-						S	
127		1.1	1.1		1,1.5	2	0			11	D	
128	+	2.0	2.0							$\Box$	D	
129	13	1.5	1.5					11		11	D	3-D with LID
130	1		1	6	0	0		1		1	S	
131				0.5-4		+		1			S	
132				0.8	0.3	2				11	D	
133				2	0.5,1,1.5					11	D	
134	+			8,10	0	0		11		T	S	
135	12			+	1	Ĭ		11		11	S	Complex Nozzles
136	1			5	1,1.5	2		++		$\top$	D	Compton Negation
137				6	1,1.5	0		+		11	S	
138				0.5-4		Ť		+	1		s	
139				0.8	0.3	2		$\forall t$	f	11	D	
140		1	1	2	0.5,1,1.5	Ī					D	
141		1.58	1.50	0.5-4	0	0		++-		+	s	
142		1.50	1.50	0.8	i	Ť		11	+2-10	1	S	
143		1		2					+2,6,10	2	_	
144	14			0.8				+	+2-10	0	_	Semi-Contoured
145	1			<u> </u>					+10	2	_	- Comment of the Comm
146				2					+2-10	0	_	
147				•					+2,6,10	+	_	
148				5					+2-10	0	_	
149				1					+10	2	_	
150				0.5-4	1	1			0	0	_	
151				0.8	0.3	2		1	Ť	1	D	
152					0.5,1,1.5	Ī	+	++-		++	D	
153				0.8	1	0	+2-10	1		++	s	
154			+	7		Ť	+10	2	1	++	D	
155		+		2.0			+2-10	0		++	S	
156		-	-	<b>→</b>	1		+10	2,3	-	+ +	D	
157		+	-		1,1.5	2	0	0	$\vdash$	++	D	
158		-	-	7	0	0	+2-10	1	-	++	S	
159			-	1	1	1	+10	2	-	++	D	
160		++	-	6		+	0	0	-	++	S	
161	1	+	+	8,10		+	1	1	<b>+</b>	++	S	
162		-+-	+			-	-	++-		1	S	3-D Clean-Combined Motions
102	1			2	-	+	_	-	0,+15	1 2 2	_	3-D Cream-Compined notions
_							•	1	+15	2,3	D	
163	-	1						-		+		
163 164 165		11				$\Box$	+2-10	2,3	+2-10	2,3	_	¢ =0° Roll & Pitch in Phase

Run No.	Con N		NPI	RF	NPB	RR	H/D	Ref	h/D <sub>R</sub>	ef	f <sub>h</sub> (Hz)	α	(*)	fa (	Hz)	,	(*)	24	(Ns)	15 P	COMMITTS
167		1	1.	.5	1.	.5	2		0.5	5	2	+1	0	2			0		0	D	4-0° Combined Motions
168	Ц				4		1		1		1		-	1		+1	10		2	D	<b>+=0</b> *
169							Ц		+				0	0			-		2	D	• - 0°
170									1		•	+	8	2			0		0	D	90° Pitch Lage Heave
171			Ц		_				1		2,3		•	2,	3	+1	0	2,	3	D	Heave
172											+		0	0			1			D	o - 0°, 90° Boll Lage Heave
173											1,1.5		_	1				نا		D	
174			Ц						1		1-3			Ц		Ī	_	1-	3	D	. D' Free. Breep in 3,10,30 S
175								_						Ц			0	L	0	D	Freq. Sweep in 3,10,30 Sec.
176			Ц				5		0		0	+2	8-8	Ш		+ 2-	-8				0 All In Press
177							1		1		0	-2	<b>→10</b>	1		-24	10	L		8	
178			Ц						1, 1,	5	2		10	2			0	L		D	+-0°
179			Ц		$\Box$		Ц		$\perp$				0 '	0		+1	0		2	D	<b>+-0</b> *
180			Ш					_	1			+	10	2			-	L		D	t leave
181						0	8 #	6.2	0,3		2*		0	0			0		0	D	V704 Bate1. 1. 3. fps
182	1	1					2 1	5	1		2+		-	11			_				+ VIOL Rate06.0.6.1.7 fps Planform 2-0, Clean Low Wing, Low
183		2					0.8	8	0		0			Ш		+0	- 10	L		S	Pleason 7-D, Clean Low Wing, Low Worstes
184														Ш		+1	.0		2	D	
185							2							П		+0	- 10		0	s	
186									+							+2,6	.10	2	, 3	D	
187									1.0		2,3			П		#	.0	3		D	0°. 90° Roll Lags Heave
188							5		0		0			П		+9	- 10		0	s	
189														$\prod$		+7	0		2	В	
190							6							$\prod$			0		9	s	
191							8,1	10						П						S	
192							0.5-	-4	+											s	
193							0.8	3	0.3		2			П						D	
194							2		0.5,	1	+	•	,	П						D	
195							0.8	3	0		0	+2	-10	1						S	
196									1			+	8	2						s	
197							2						-10	0						S	
198								,					10	2.3						Д	
199							5						-10	0						s	
200									*		+	-	10	2						D	
201									1,1.	5	2		0	0						D	
202	21						0.5-	-4	0		0		1	1				П		s	Pleaform 2-D, High Wing, Low
203			T	$\neg$	$\neg$		0.8		0.3		2			П	7					D	
204							2		0.5	1	+									D	
205			T		1	1	5,6		0		0			IT						S	
206							5		1,1.	5	2				T	•	1			D	
207							T		0		0				1	+0	- 10	7		S	
208			1	1	1	7	-	,	1		1				1	+1	_		2	D	
209			1		1	7	0.8						- 2		7	_	- 10	_	0	S	
210			1	1	1	7	+							1	7	+1			2	D	
211			1	1	1	7	2		1	1					7	_	- 10	$\overline{}$	0	S	
212	-		1	1	1	┪	1	,	1	1				1	7	+1		2,	. 3	n	
213	22		1	+	1	7	0.5	-4	+	1	*			1	7	_	0	-		S	Planform Z-D, Mid Wing, Low Mossies
214	1		1	1	+	7	0.8	_	0.3	1	2			1	1	1	-	1	_	D	W4445
215	-	,	+	+	1	-	0.5	-	0	+	0			-	1	1		H	-	S	Low Wine Low Moreles Low Total
216	3		+	+	-‡	7	+	_	Ĭ	+	ĭ			+	7	1	-	H	-		Low Wine Low Mossles Low Tail 3 Jet Supersonic V/SIOL
217	3	_	1 0	1	-	1	0.5.	0.8	+	+	+		-	1	-	1		H		S	Contoured Lower Fuselage
_	-	+	1.84	+	1.0	7	- 2,	4	+	+	+			+	+	+		H	-	S	
218	-	-	1	+	2.5	7	+	-	+	+	+	_		1	-	-		1		S	
219			1.8		3.5				1	- 1										s	



Run No.	Config.	NPRF	NPRR	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	fa(Hz)	γ(*)	f <sub>y</sub> (Hz)	Run Type	COMMENTS
275	3	2.0	1.0	8,10	0	0	0	0	0	0	S	
276	1	1.5	1.0				*		1	1	S	
277			4.4	8			<del>+</del> 0-10				S	
278		1	1	+	*	*	<u>+</u> 10	2			D	
279				1.3 2 5.	7 0.3	2 *	0	0		1	D	*VTOL RATE=0.1,1,3 fps
280	+			2 2 5	1	**				1	D	*VTOL RATE=0.1,1,3 fps
281	31			2	0	0	+0-10	0		0	S	Planform 2-D, 3 Jet, Low Wing
282				•			<u>+</u> 10	2		1	D	
283				0.5-4	+	*	0	0			S	
284				0.8	0.3	2		1			D	
285	+			2	0,5,1	*					D	
286	32			0.5-4	0	0					S	3 Jet Low Wing with LID
287	-			0.8	0.3	2					D	
288				2	1,1.5	+			*		D	
289				1.1	0	0			+0-10		S	
290				0.8	1				*	¥	S	
291				+					+10	2	D	
292				2					+0-10	*	s	
293	+			*					+10	2	D	
294	31			0.8					+0-10	0	S	Planform 2-D, 3 Jet, Low Wing
295	L			+					+10	2	D	
296				2					+0-10	0	S	
297				+					+10	2	D	
298				5,6					0	0	S	
299				5					+0-10	0	S	
300					1				+10	2	D	
301				+	1,1.5	2			0	0	D	
302	+			8,10	0	0			I		S	
303	33			+							S	3 Jet, Mid Wing
304				0.5-4	+	•					S	
305				2	0,5,1,	2					D	
306	34			0.5-4	0	0					S	3 Jet, High Wing
307				0.8	0.3	2					D	
308				2	0.5,1,	+			*	•	D	
309				0.8	0	0			+10	2	D	
310				+	1	T			+0-10	0	S	
311				2					+0-10	•	S	
312				+					+10	2	D	
313				5,6		*			0	0	S	
314				5	1,1,5	2					D	
315	+			8,10	0	0					S	
316	35			0.5-4	1	1						4 Jet, Mid Front Jets
317				0.8	0.3	2					D	
318				2	0.5,1,	2,3		$\Box$	+		D	
319				0.8	0	0		$\Box$	+0-10	+	S	
320				+	1	T	$\top$	H	+10	2	D	
321	$\top$	1		2					+0-10	0	S	
322				¥					+10	2,3	D	
323	$\top$		+	5,6					0	0	S	
324		+	+	5		1			+0-10	4	S	
325	-	+	-			•						
326	1	+	-		115	-	1		+10	2	D	
326	++	+	+	1	1,1,5	2	10.10	1	0	0	D	
328	-	+	-	-	0	0	+0-10	2			S D	

Run No.	Config.	NPRF	MPR	H/D <sub>Ref</sub>	h/I	Ref	f <sub>h</sub> (	Hz)	a(*)	fa(Hz)	1	·(*)	f <sub>Y</sub> (Hz	Run Type	COMMENTS
329	35	1.5	4.4	8,10		0			0	Io		0	0	s	
330				2			Ш		+0-10	1	L			S	
331						L			<u>+</u> 10	2				D	
332		Ш		0,8					+0-6	0				S	
333									+6	2				D	
334	36								+0-6	0				S	4 Jet, Forward Front Jets
335									<u>+</u> 6	2				D	
336				0.5-4	1	*	1		0	0				S	
337				0.8	0	3	2	2		Li				D	
338				2	0.5	,1,	1.5					_		D	
339			1	0.8	0	)	C				+0-	10	+	S	
340					_						+1	0	2	D	
341				2							+0-		0	S	
342			1	*							+1	0	2	D	
343			1-3.	_								0	0	S	Thrust Bias
344		1-2.0	4.4				1							S	Thrust Bias
345		1.5	1	5,6	-		2	_			تــا	_		S	
346				5	1	_	0				+0-			S	
347	$\perp$			1		-					<u>±1</u>	0	2	D	
348				1	1,1	.5	1					0	0	D	
349	1			8,10	0	)	0	)						S	
350	38		1.5	0.5-4			1							S	2 Jet, Forward Front Jet
351				0.8	0.	3	2							D	
352				2	0.5,	1,1	5				1	_		D	
353			Ш	0.8	0	)					+0-	10	+	S	
354				1							+1	0	2	D	
355				2									*	D	
356				1							+0-	10	0	S	
357		+	1-2	0.8,2								0		S	
358		1	1.5											S	
359		1.5	1.5	5,6								7		S	
360				5							+0-	10	•	S	
361					1	_					<u>+</u> 1	0	2	D	
362				1	1,1	.5	_ 2					0	0	D	
363	•			8,10	0		0							S	
364	39													S	2 Jet, Mid Front Jet
365				5,6							,	,		S	
366				5							+0-	10	-	S	
367					-	_					+10		2	D	
368				1	1,1	.5	2					0	0	D	
369				0.8	0	)	0				+0-	10	+	S	
370				1							<u>+1</u>	0	2	D	
371				2									2,3	D	
372			1	1							±0-	10	0	S	
373			1-2									0		S	
374		1-2	1.5	•										S	
375		1.5	1.5	0.5-4	-	_		7						S	
376				0.8	0.	_	2	_						D	
377				2	0.5,	1,1	. 5 2	,3	1					а	
378			T		0	1	0		+0-10					S	
379	_		1						+10	2				D	
380	1	1.1	1.1	0.5-4				T	0	0				S	Subsonic V/STOL REPEAT RUN 11
381		1.25	1.2	15										S	
382		2.0	2.0					1						S	REPEAT RUN 121
183		1.5	1.5	1		, 1	1	7				1		S	REPEAT RUN 88
84	1	1	I	2	1	5	2	1	1				1	D	REPEAT RUN 90

Run No.	Config.	NPRF	NPRR	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	fa(Hz)	Y(*)	f <sub>Y</sub> (Hz)	Run Type	COMMENTS
931	4	1.5	1.5	0.5-4	0	0	0	0	0	0	S	Inner Region Plate
932	4	1.5	1.5	0.8	0.3	2	0	0	0	0	D	
933	4	1.5	1.5	2	1,1.5	2	0	0	0	0	D	
934	4	1.5	1.5	2	0	0	0	0	± 2-10	0	S	
935	4	1.5	1.5	2	0	0	0	0	<u>+</u> 10	2	D	
936	4	1.5	1.5	4.5-5.5	0	0	0	0	0	0	S	
938	4	1.5	1.5	5.6	0	0	0	0	0	0	S	
939	4	1.5	1.5	5	1,1.5	2	0	0	0	0	D	

#### APPENDIX B

#### INDUCED AERODYNAMIC DATA AT STATIC HOVER CONDITIONS

Presented herein are the induced aerodynamic lift, pitching moment and rolling moment data obtained at static hover, fixed deck conditions over a range of heights, deck pitch angles and roll angles. The steady state data are plotted versus height above the deck, pitch angle, roll angle, nozzle pressure ratio, and thrust bias.

For the two baseline configurations, subsonic V/STOL - Configuration 1 and supersonic V/STOL - Configuration 3, representative induced axial force, side force, and yawing moment data are also presented to illustrate the minimal variations which occur in these parameters. The model configurations tested are summarized in Table B-1. The static data provide a baseline of comparison for evaluating the effects of the deck motion on the induced aerodynamic characteristics. The data plots are separated into sections corresponding to the configuration variables listed below.

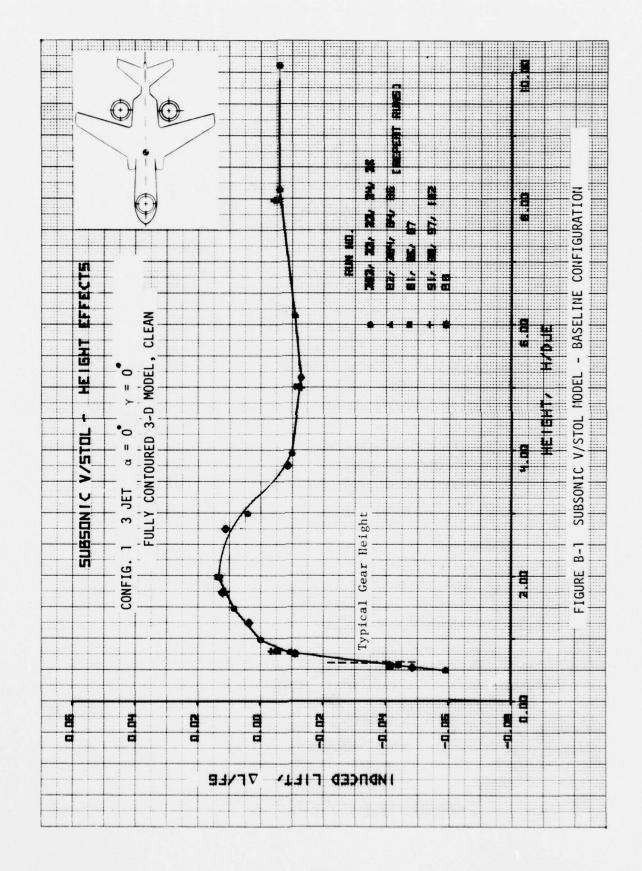
	CONFIGURATION VARIABLE	CONFIG. NO.	FIGURES
1.	SUBSONIC V/STOL:		
	Fully Contoured 3-D Model:		
	Clean, 3 Jet (Baseline Config.)	1	B-1 through B-13
	Nozzle Arrangement (1 & 2 Jet)	1	B-14 through B-18
	Nozzle Pressure Ratio	1	B-19 through B-23
	Thrust Bias	1	B-24 through B-25
	Deck Size	1	B-26 through B-30
	Wing Pods	11	B-31 through B-35
	Complex Nozzles	12	B-36 through B-39
	Lift Improvement Devices	13	B-40 through B-42
	Semi-Contoured Model	14	B-43 through B-47
	Planform 2-D Model		
	Low Wing with Raised Tail	2	B-48 through B-52
	Mid Wing	22	B-53
	High Wing	21	B-54 through B-56
	Low Wing with Low Tail	23	B-57
2.	SUPERSONIC V/STOL:		
	Semi-Contoured Model		
	<pre>3 Jet (Baseline Config.)</pre>	3	B-58 through B-57
	1 Jet	3	B-68 through B-71

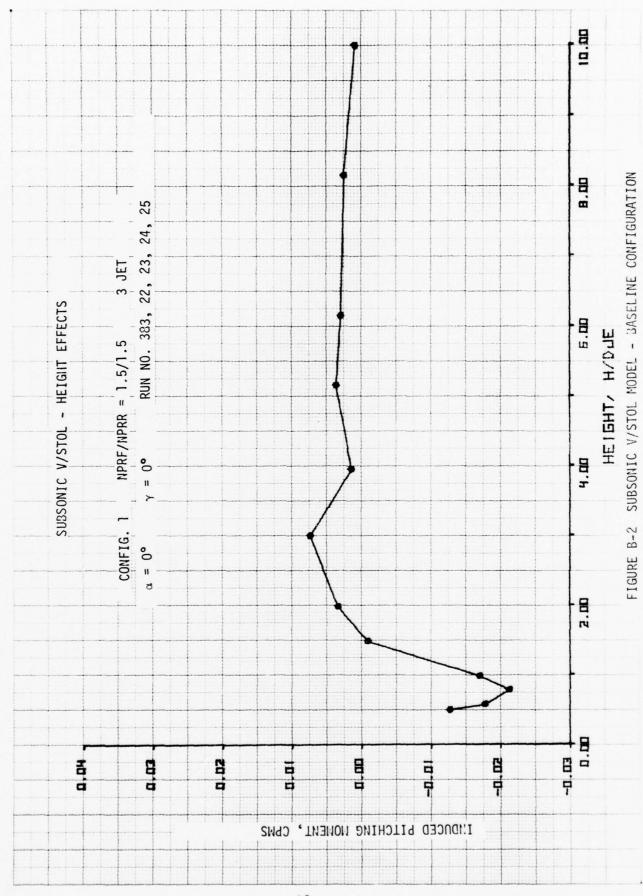
CO	NFIGURATION VARIABLE	CONFIG. NO.	FIGURES
	Thrust Bias	3	B-72 through B-73
Pla	nform 2-D Model		
	3 Jet		
	Low Wing-Clean	31	B-74 through B-78
	Lift Improvement Devices	32	B-79 through B-81
	Mid Wing	33	B-82
	High Wing	34	B-83 through B-85
	4 Jet		
	Forward Fan Position	36	B-86 through B-90
	Thrust Bias	36	B-91
	Mid Fan Position	35	B-92 through B-96
	2 Jet		
	Forward Fan Position	38	B-97 through B-99
	Thrust Bias	38	B-100
	Mid Fan Position	39	B-101 through B-105
	Thrust Bias	39	B-106
3. <u>INN</u>	NER REGION MODEL	4	B-107 through B-109

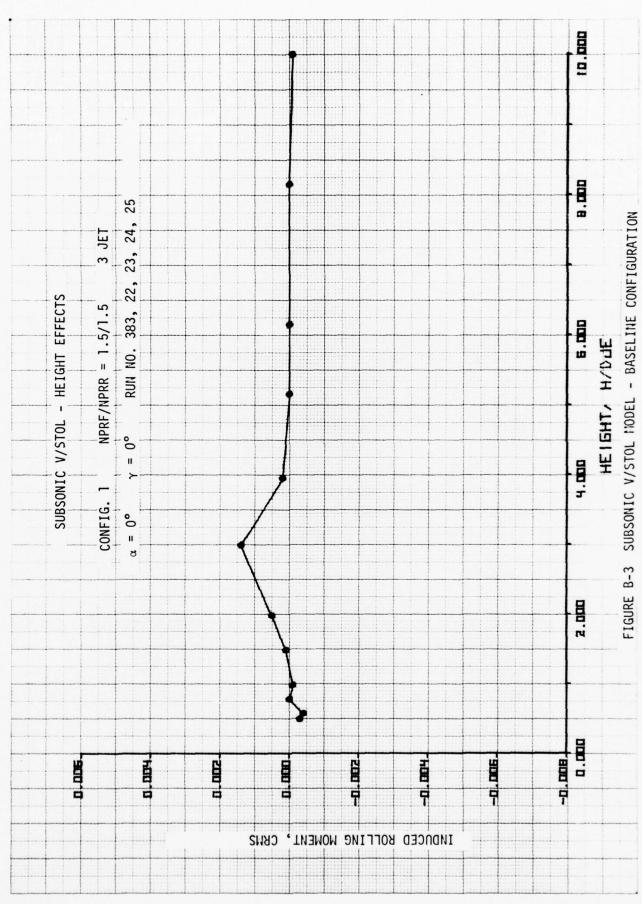
CONFIG.			NOZZLES			
NO.	DESCRIPTION	NO.	TYPE	POSITION	WING	TAIL
Subsoni	tc V/STOL:					
1	3-D Clean	3*	Fan	Mid	Low	High
11	3-D with Wing Pods	3*	Fan	Mid	Low	High
12	3-D with Complex Nozzles		Fan	Mid	Low	High
13	3-D with 3 Sided LID	3	Fan	Mid	Low	High
14	Semi-Contoured	3	Fan	Mid	Low	High
2	2-D Clean	3	Fan	Mid	Low	High
21	2-D with High Wing	3	Fan	Mid	Low	High
22	2-D with Mid Wing	3	Fan	Mid	Mid	High
23	2-D with Low Tail	3	Fan	Mid	Low	Low
4	Inner Region Plate	3	Fan	Mid		
Supersor	nic V/STOL:					
3	Semi-Contoured	3*	1-Fan,2-Jet	Mid	Low	Low
31	2-D Clean	3	1-Fan, 2-Jet	Mid	Low	Low
32	2-D with 3 Sided Lid	3	1-Fan, 2-Jet	Mid	Low	Low
33	2-D with Mid Wing	3	1-Fan,2-Jet	Mid	Mid	Low
34	2-D with High Wing	3	1-Fan, 2-Jet	Mid	High	Low
35	2-D Clean	4	2-Fan, 2-Jet	Mid	Low	Low
36	2-D Clean	4	2-Fan,2-Jet	Forward	Low	Low
38	2-D Clean	2	2 Fan	Forward	Low	Low
39	2-D Clean	2	2 Fan	Mid	Low	Low

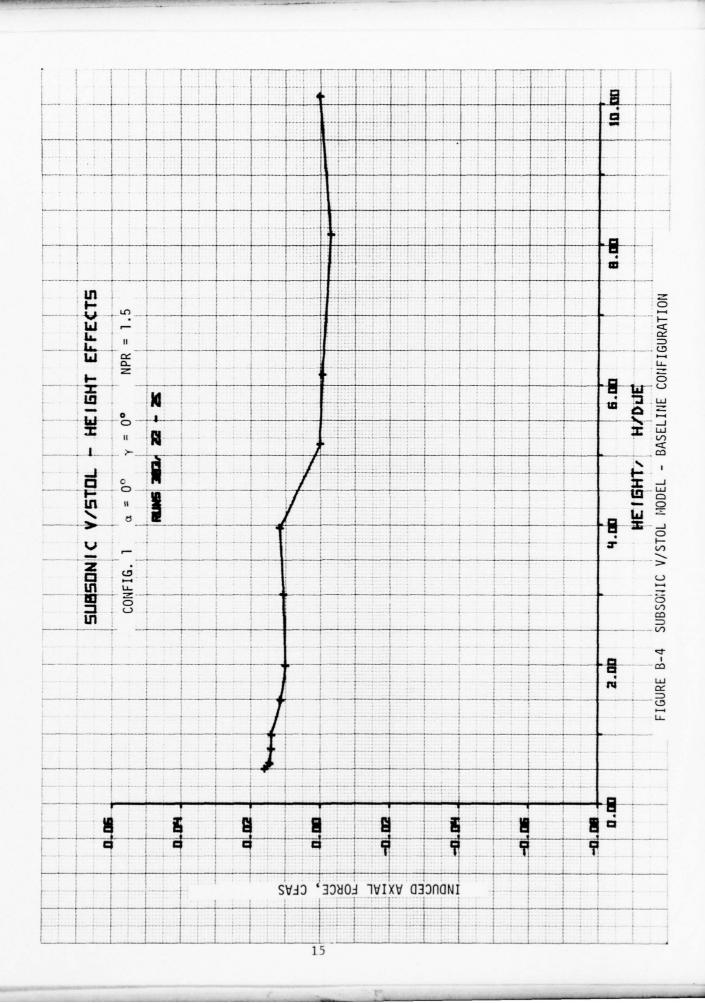
<sup>\*</sup> Configuration also tested with only 1 front nozzle or 2 aft nozzles operating

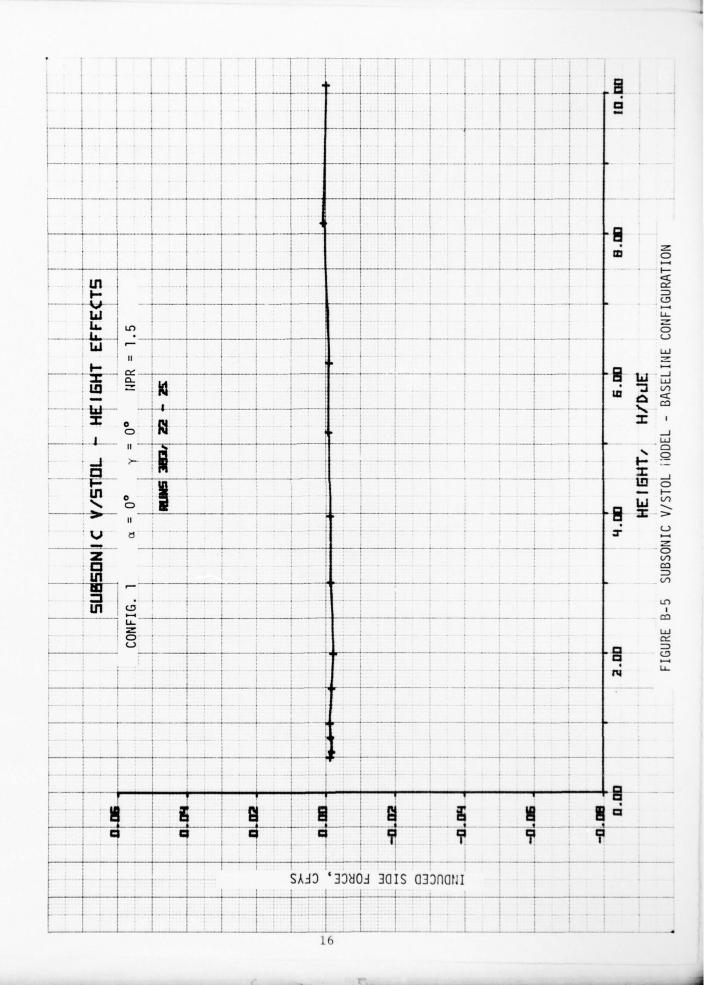
TABLE B-1 CONFIGURATION SUMMARY

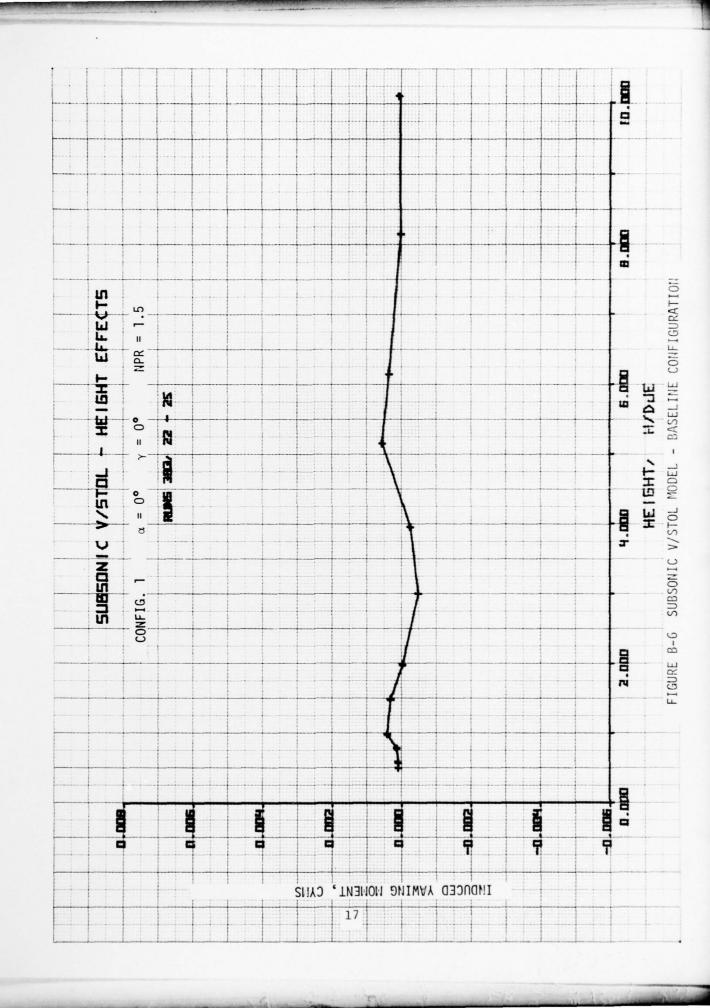


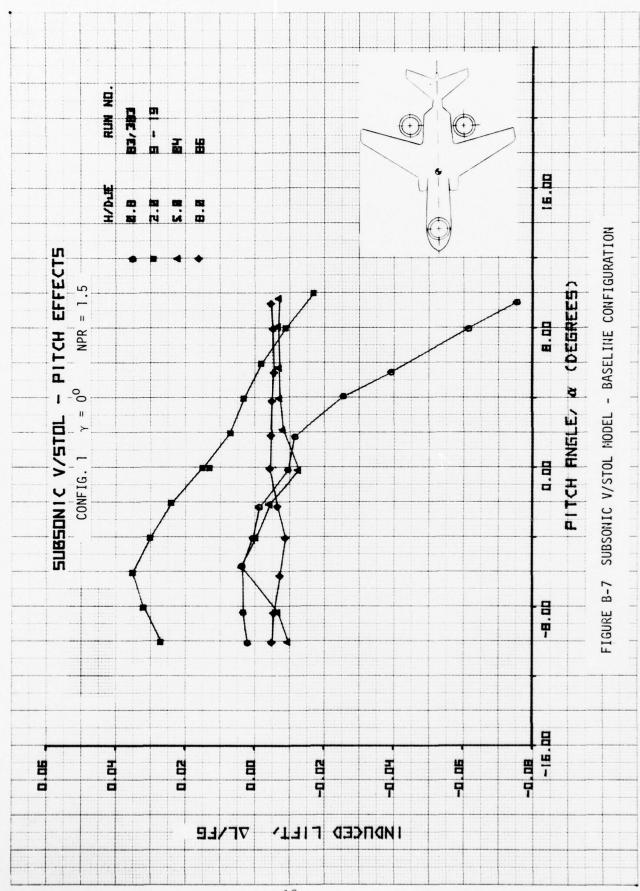


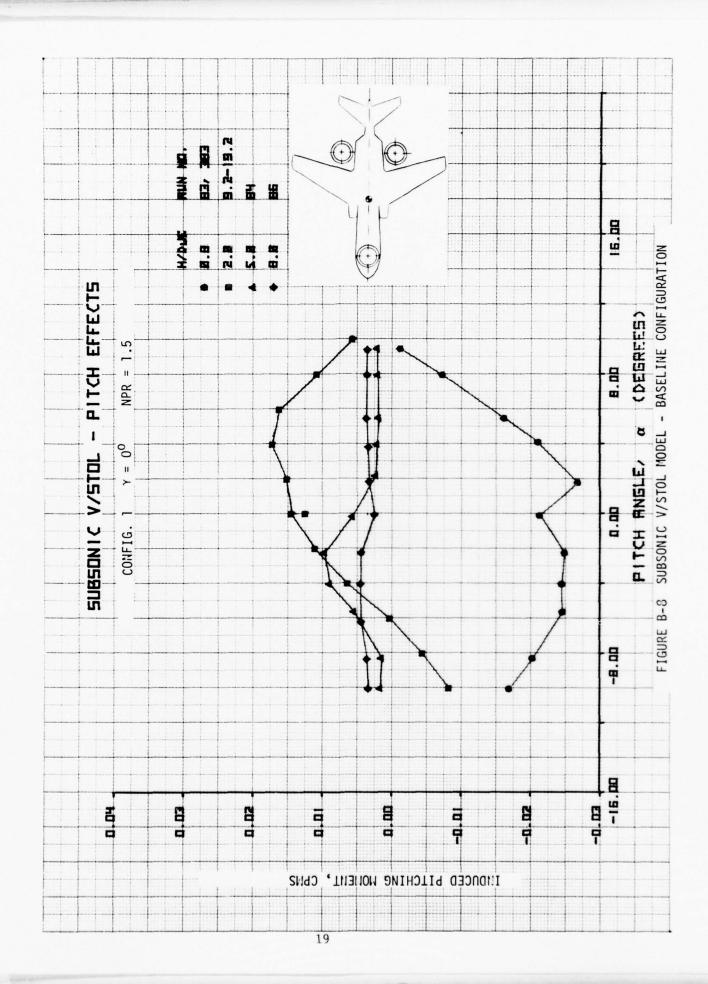


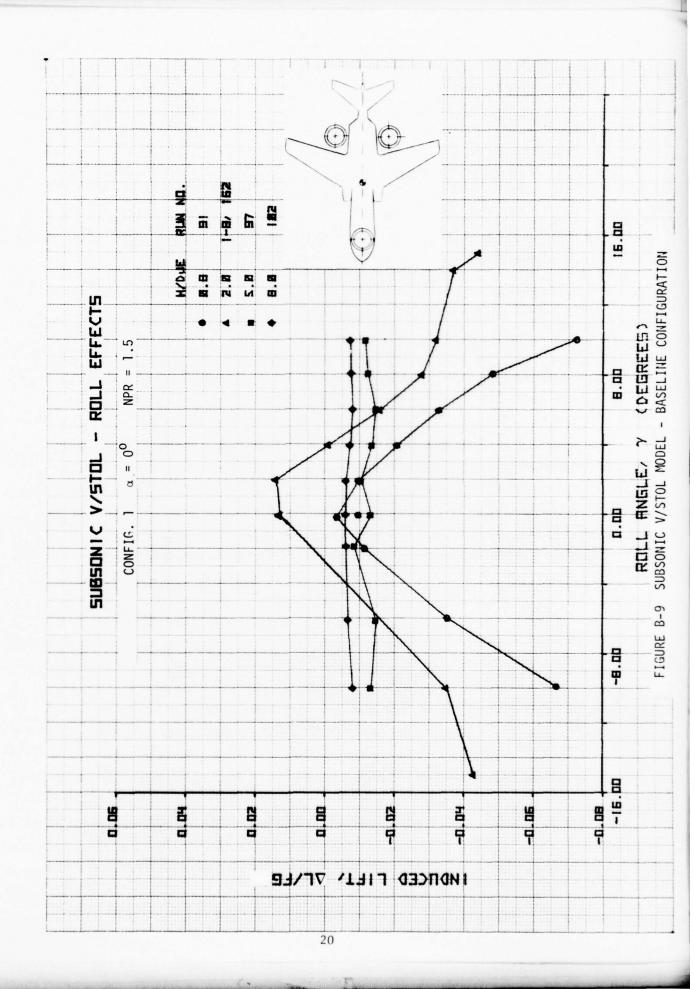


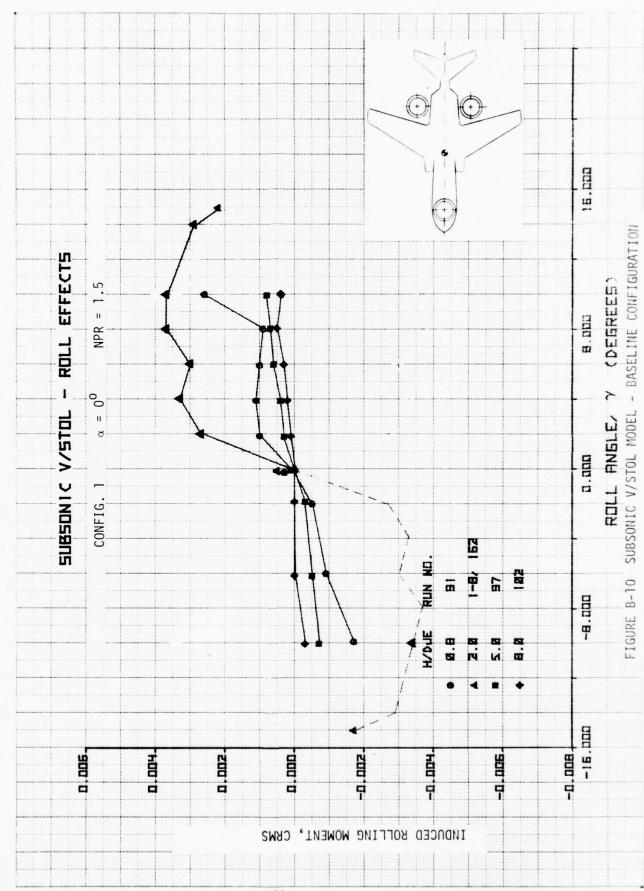


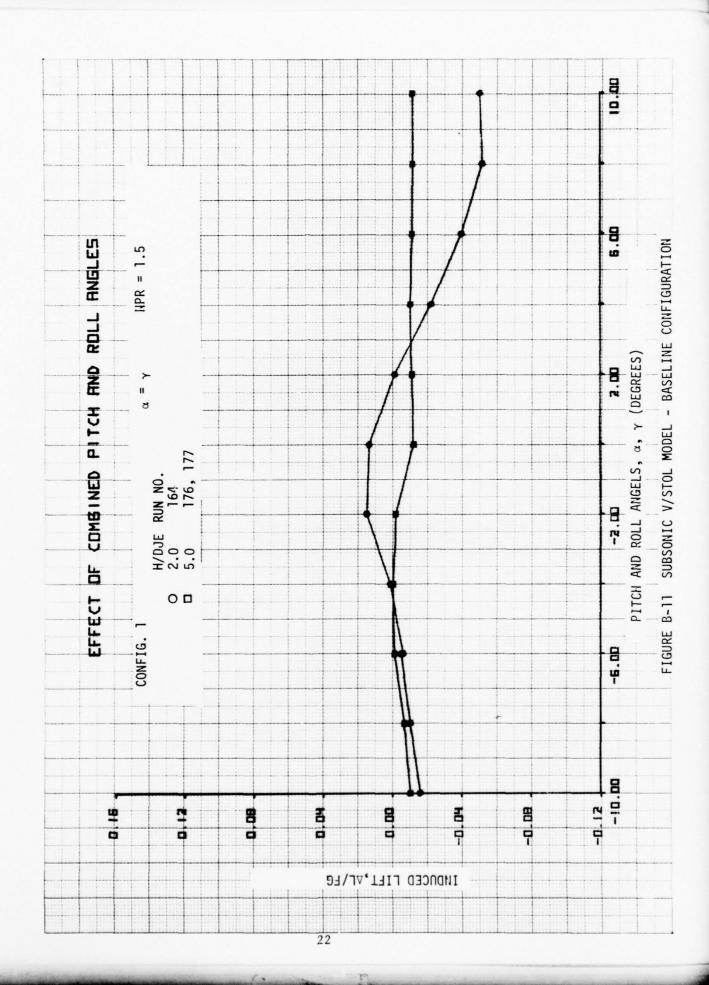


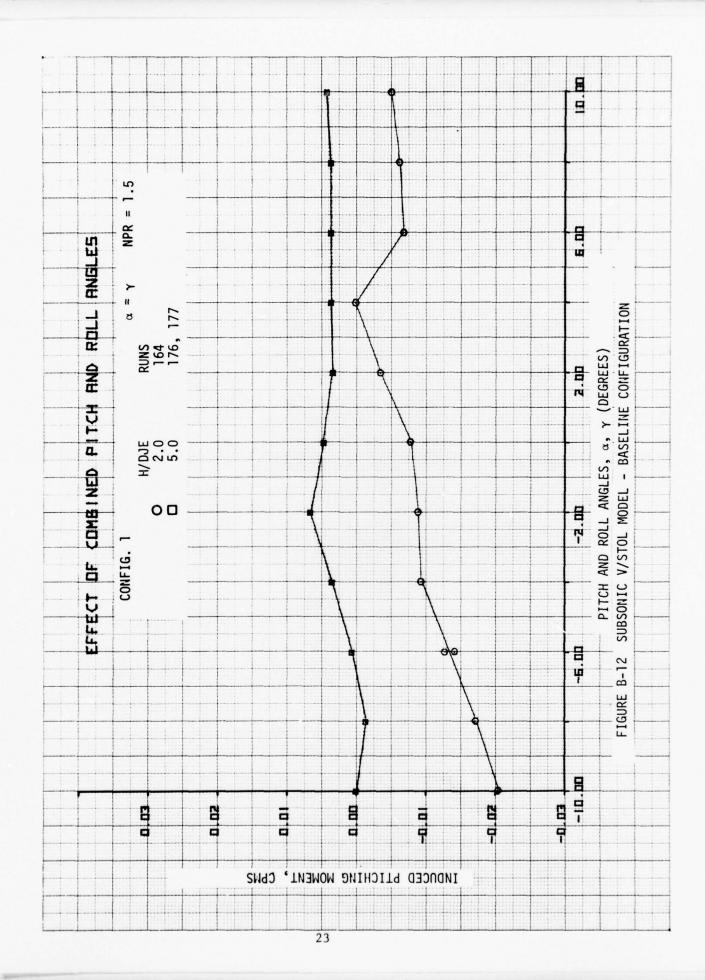


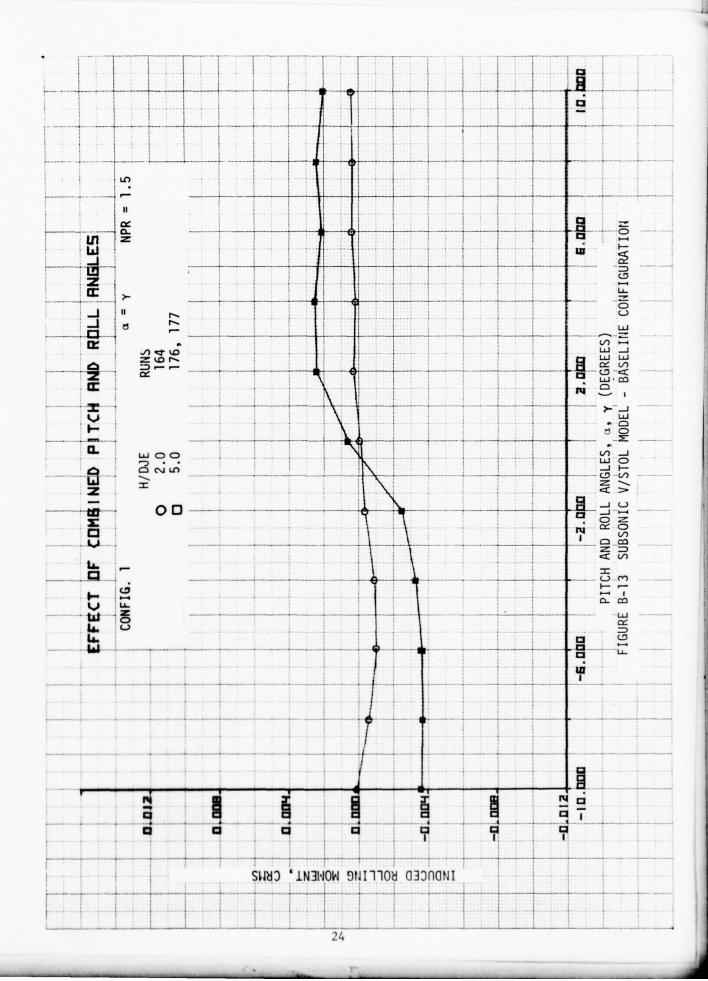


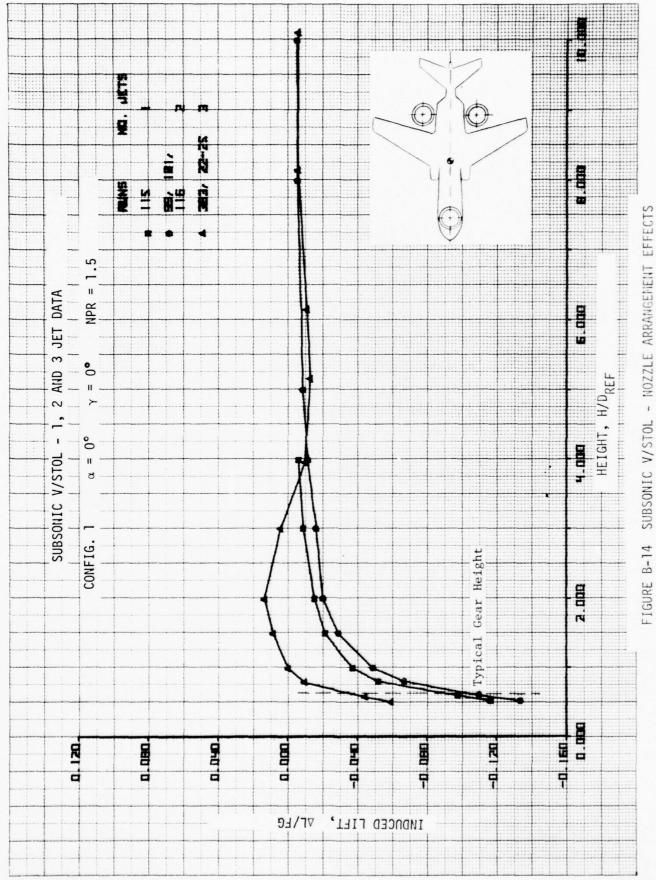


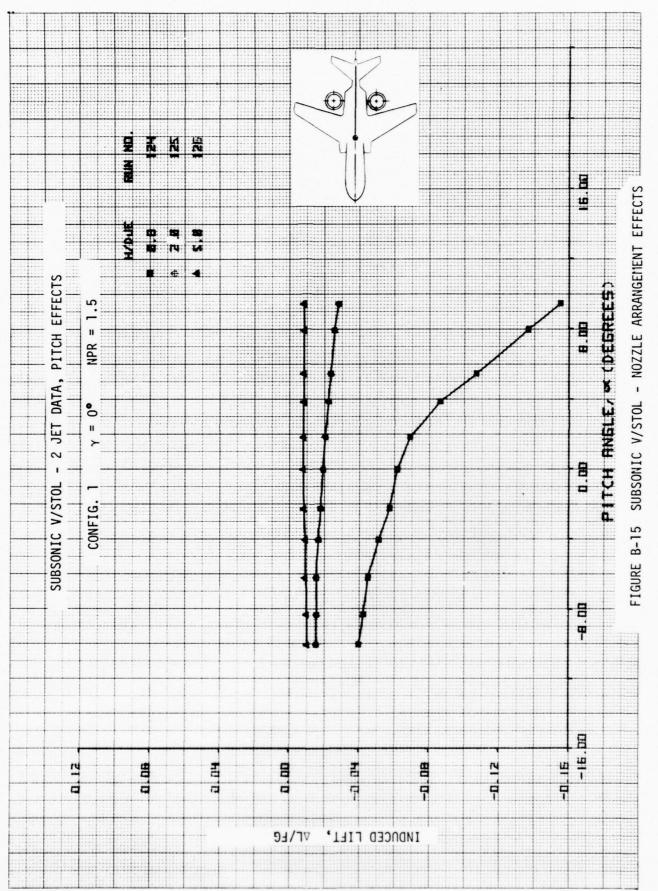


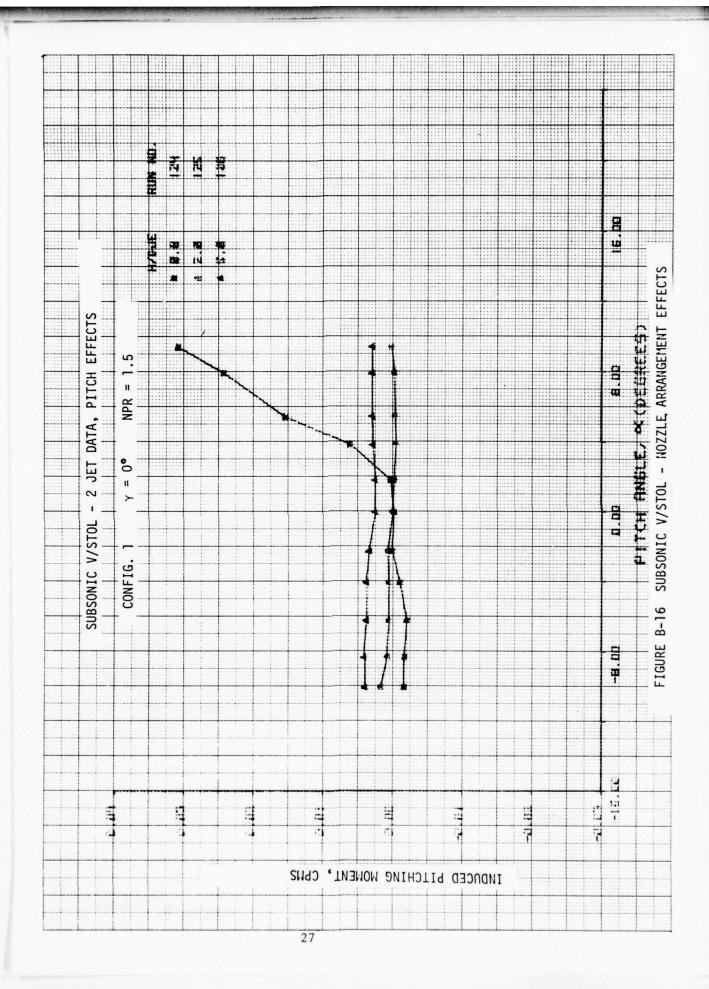


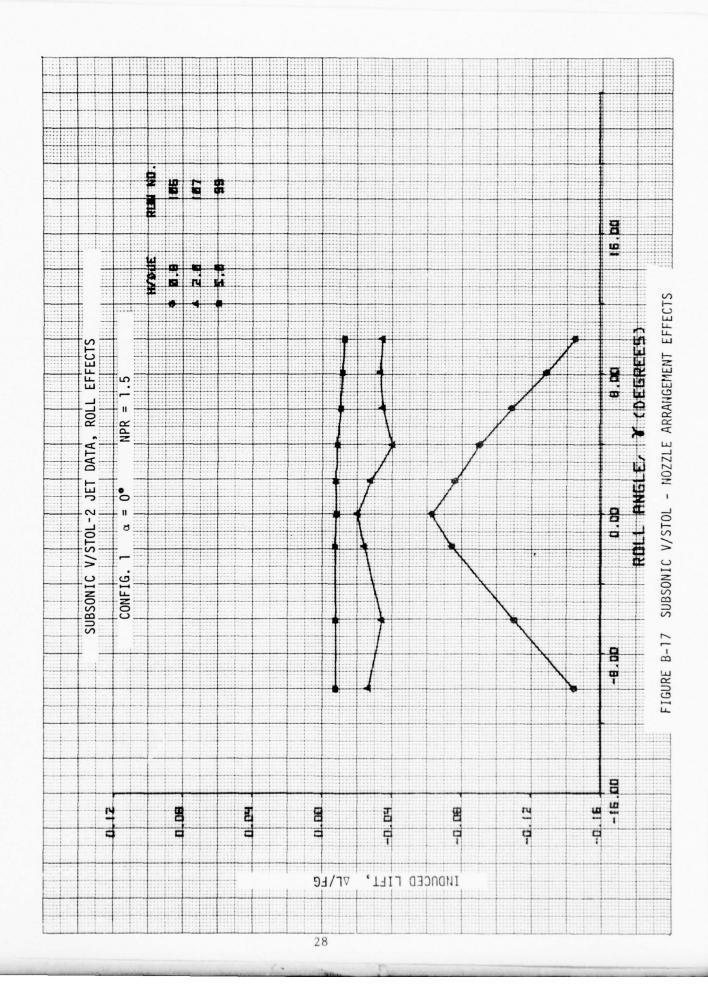


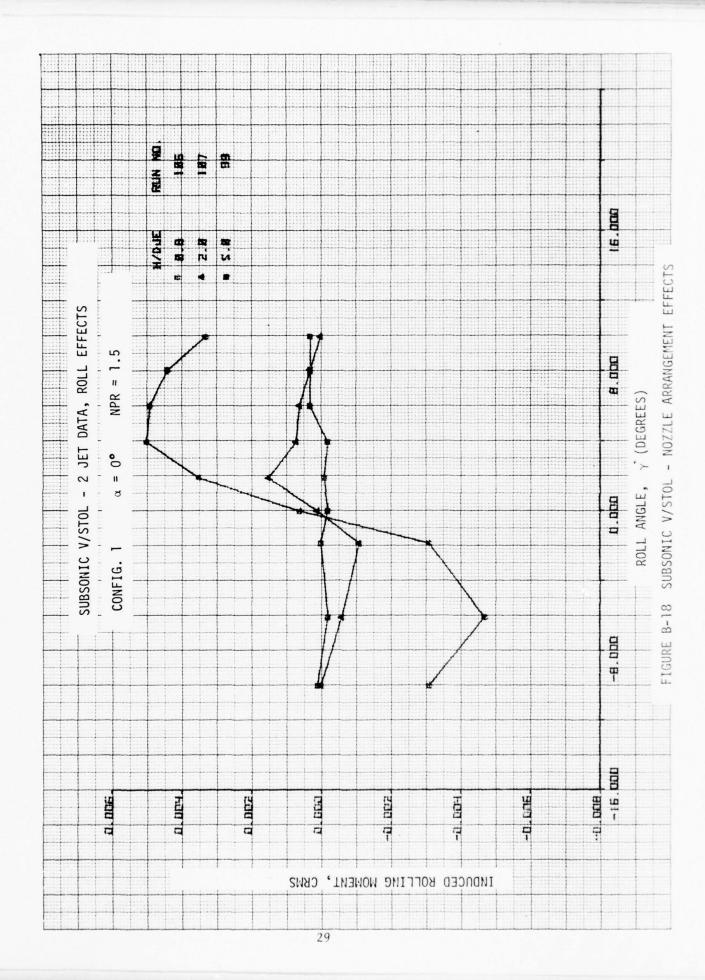


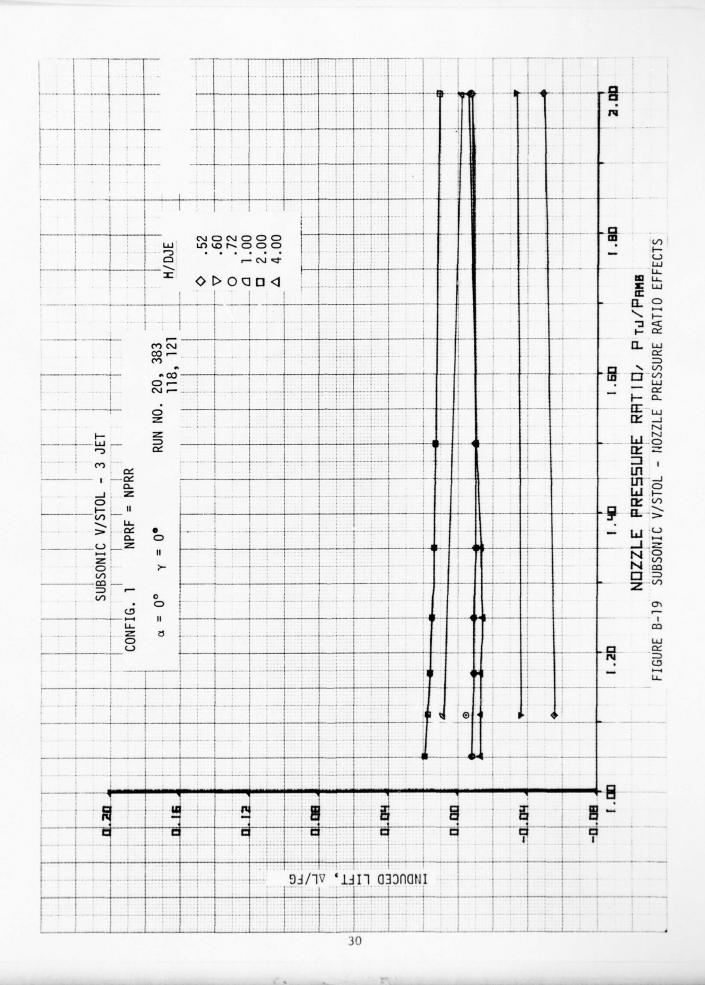


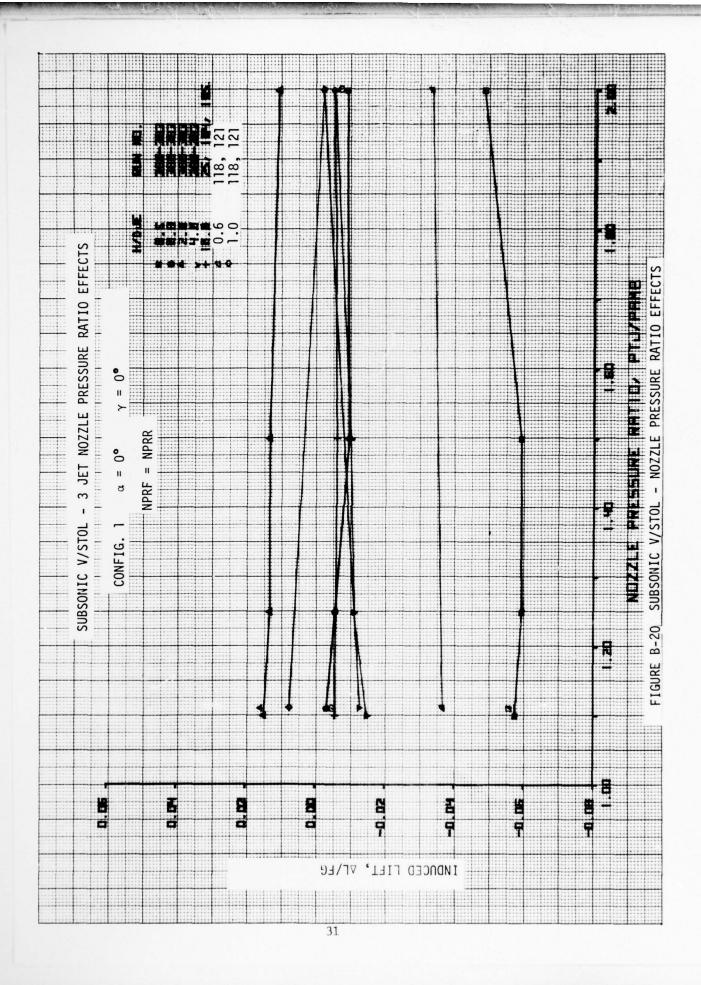


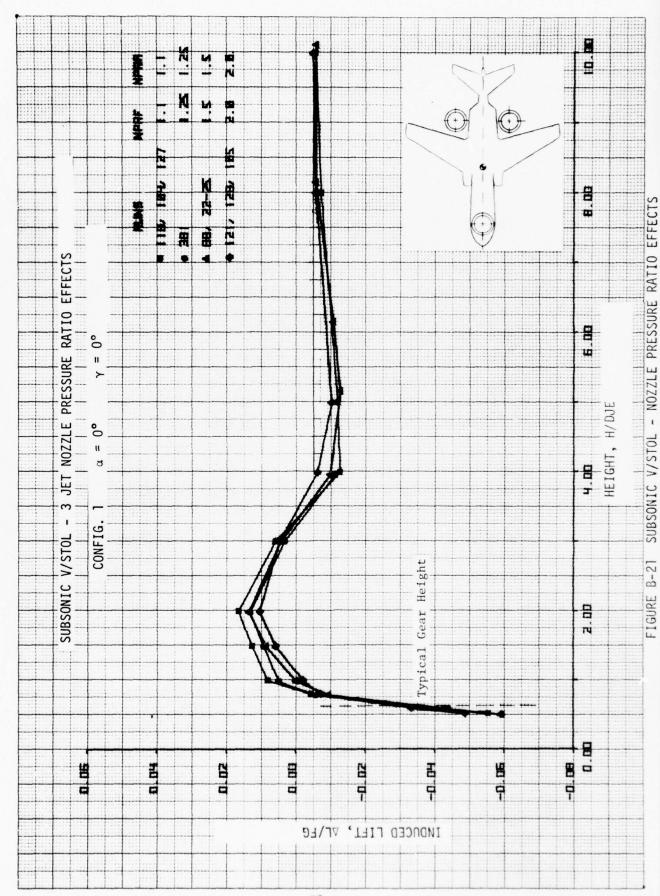


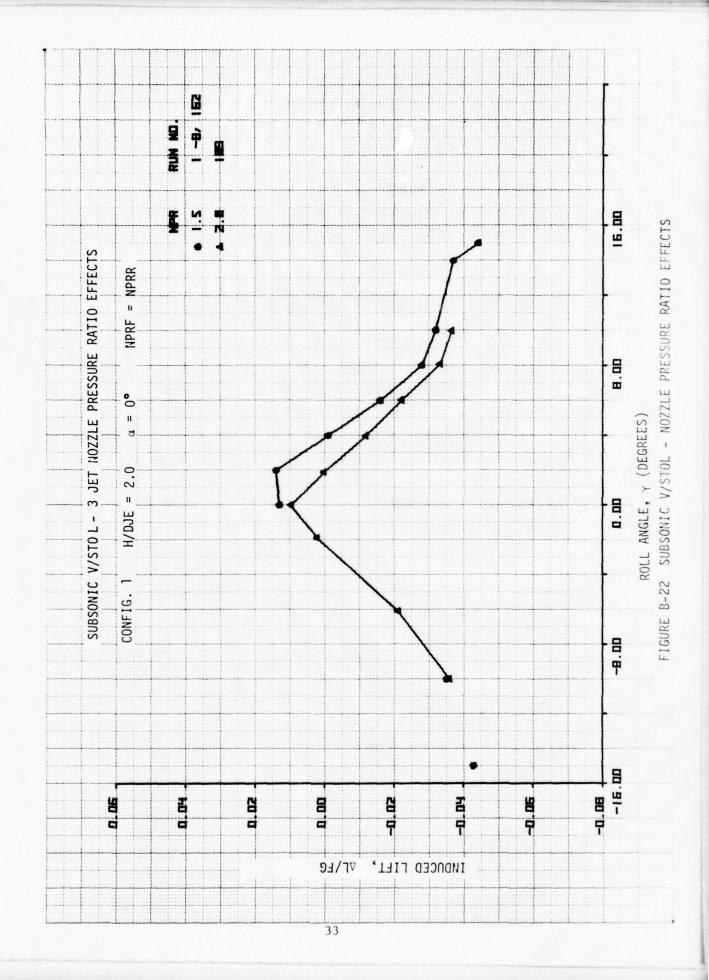


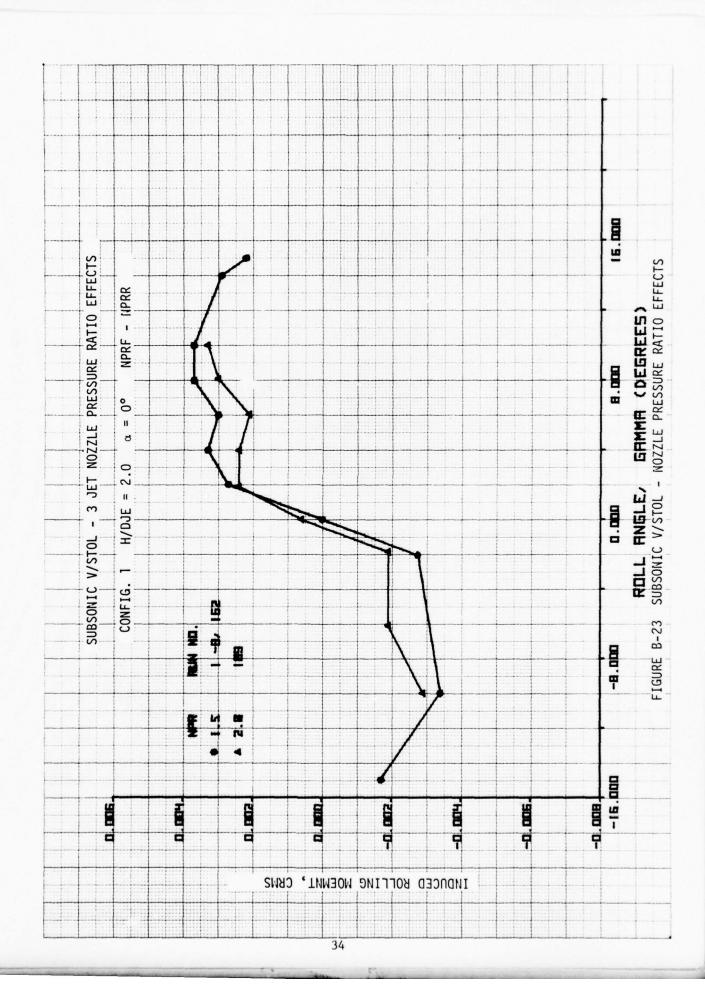


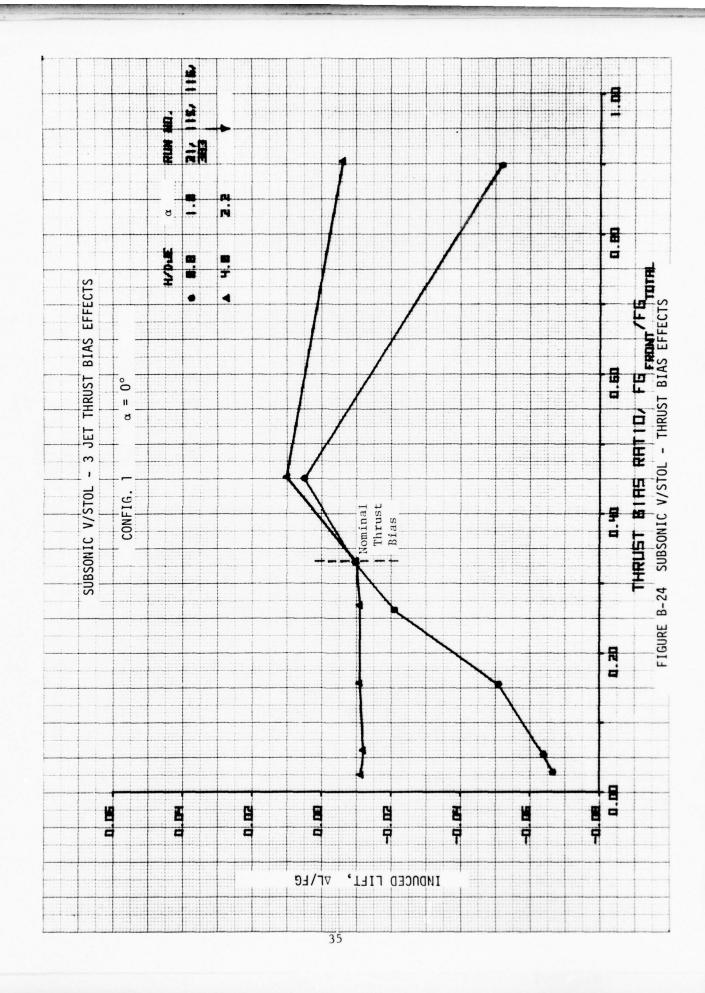


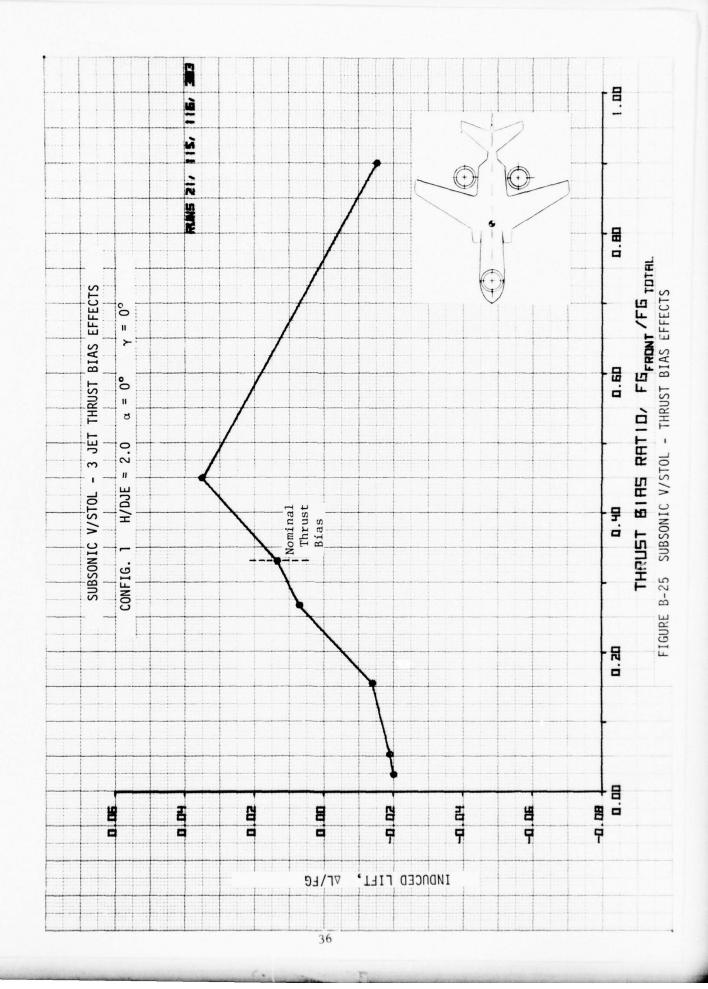


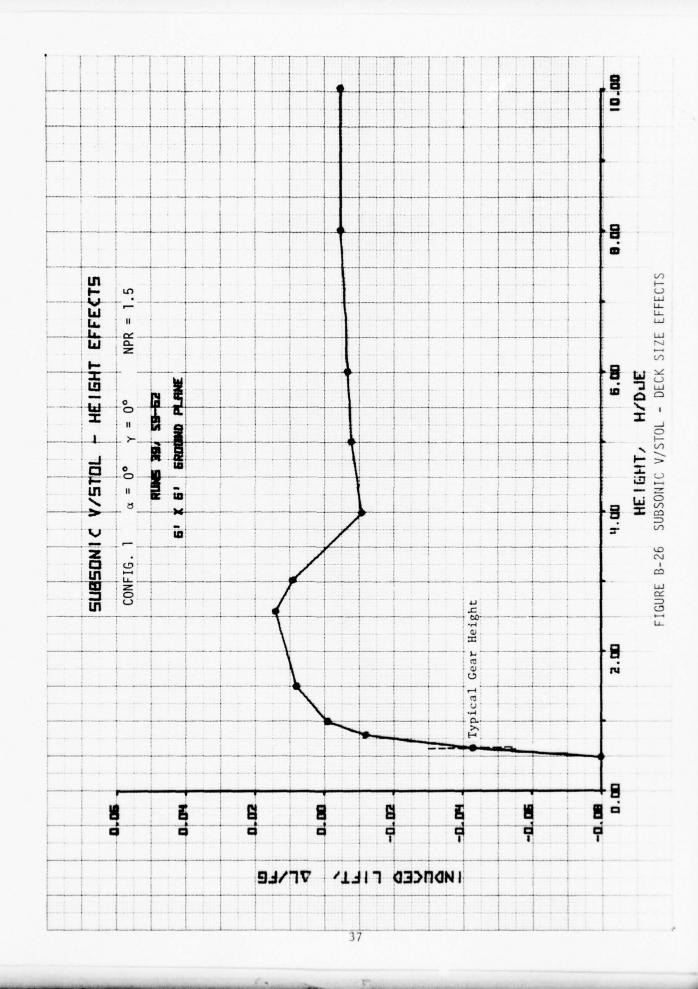


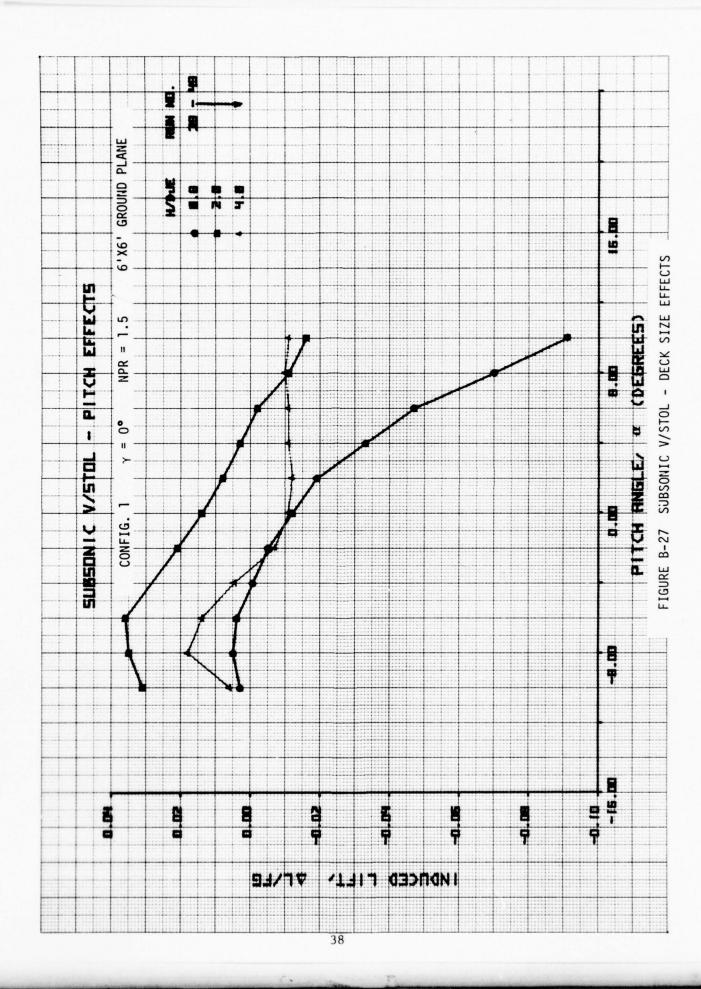


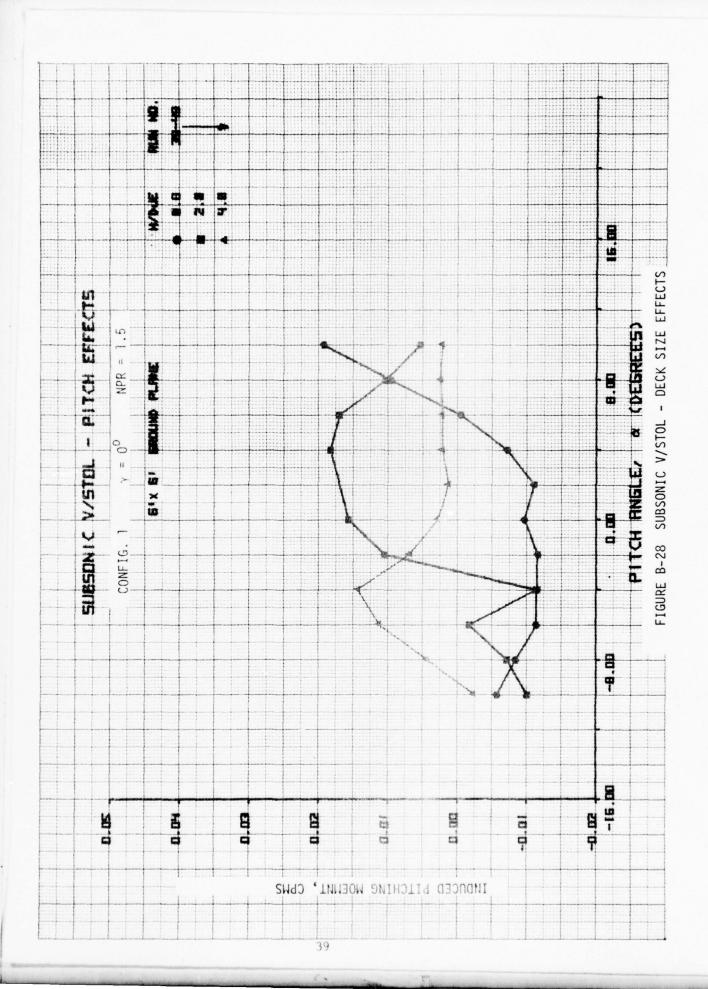


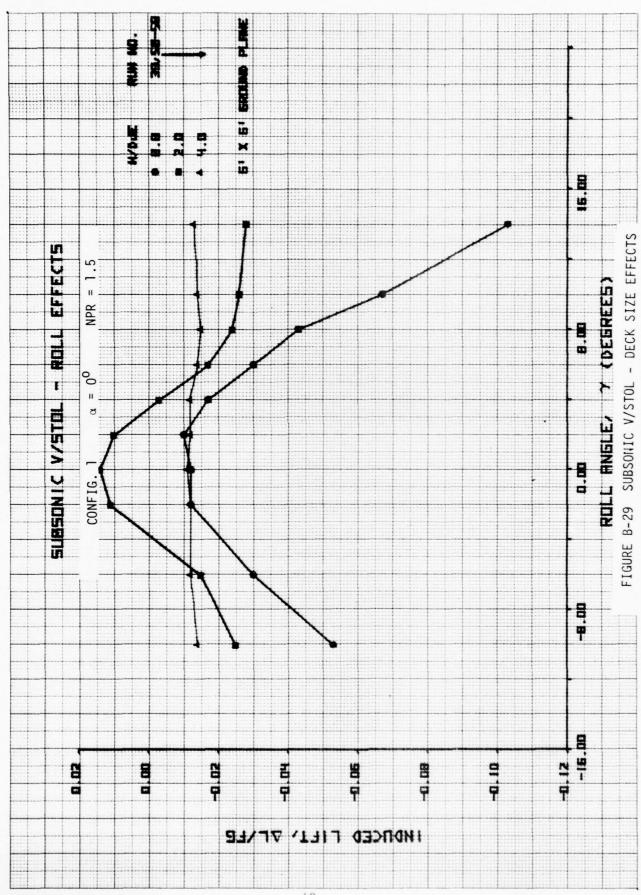


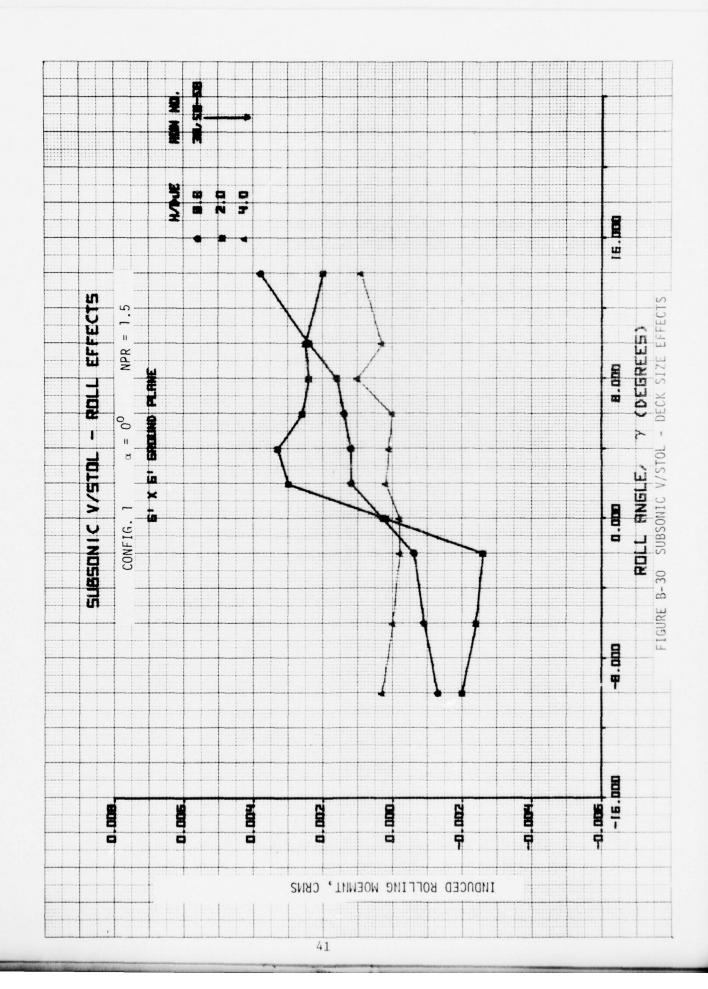


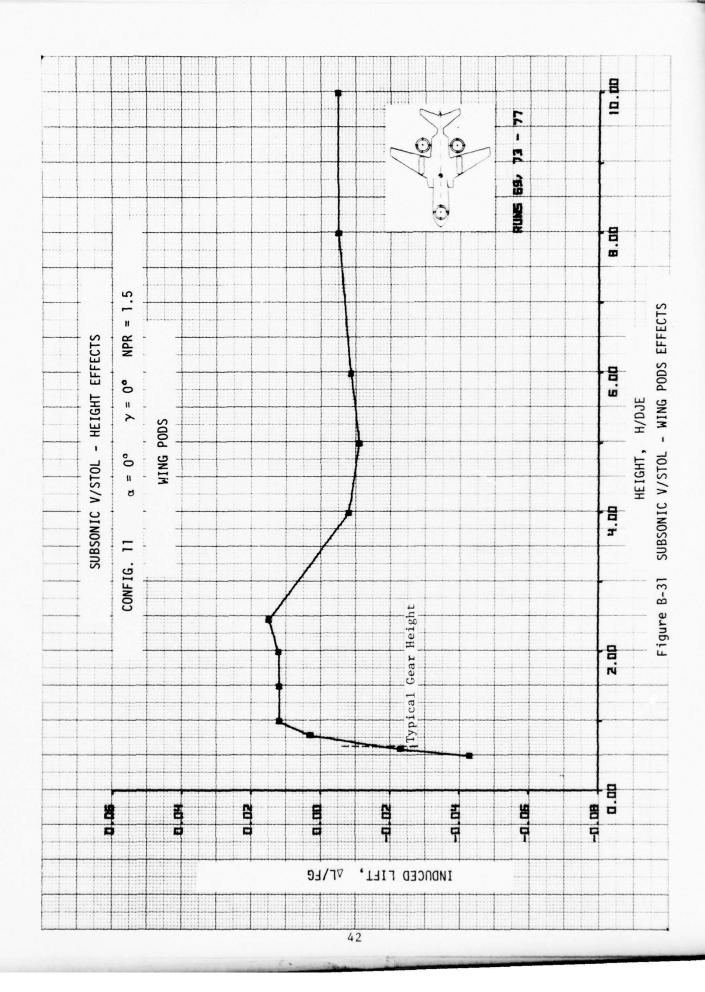


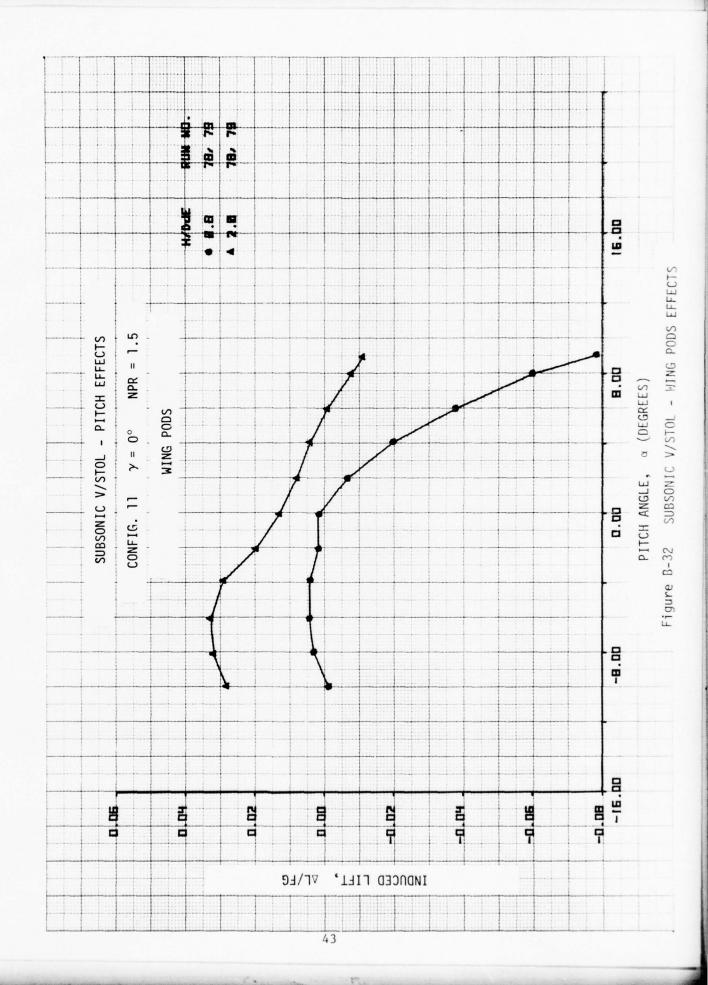


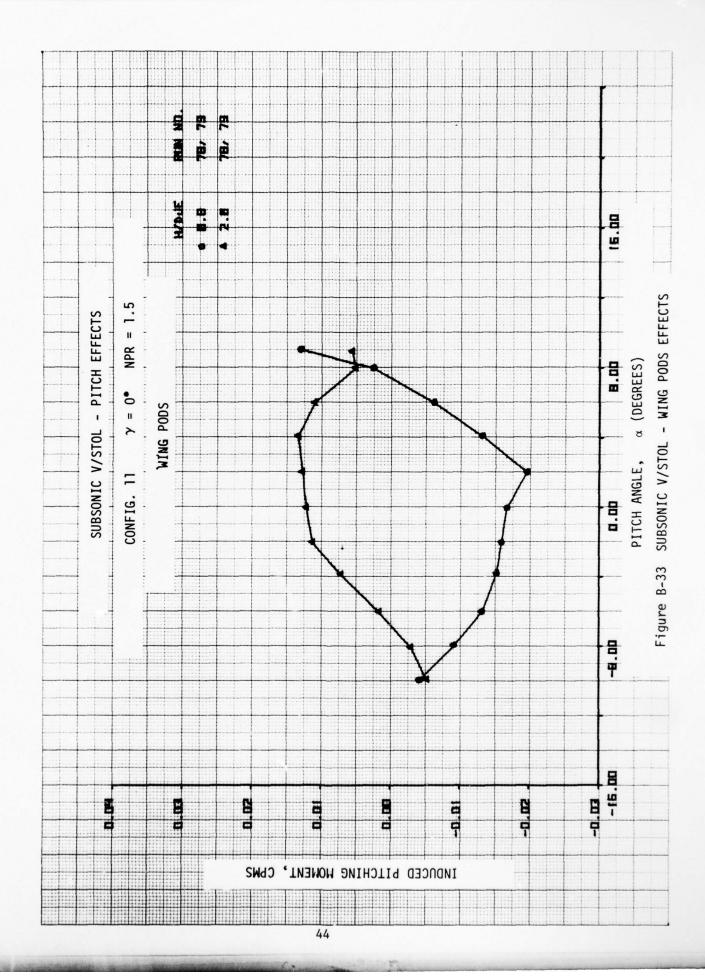


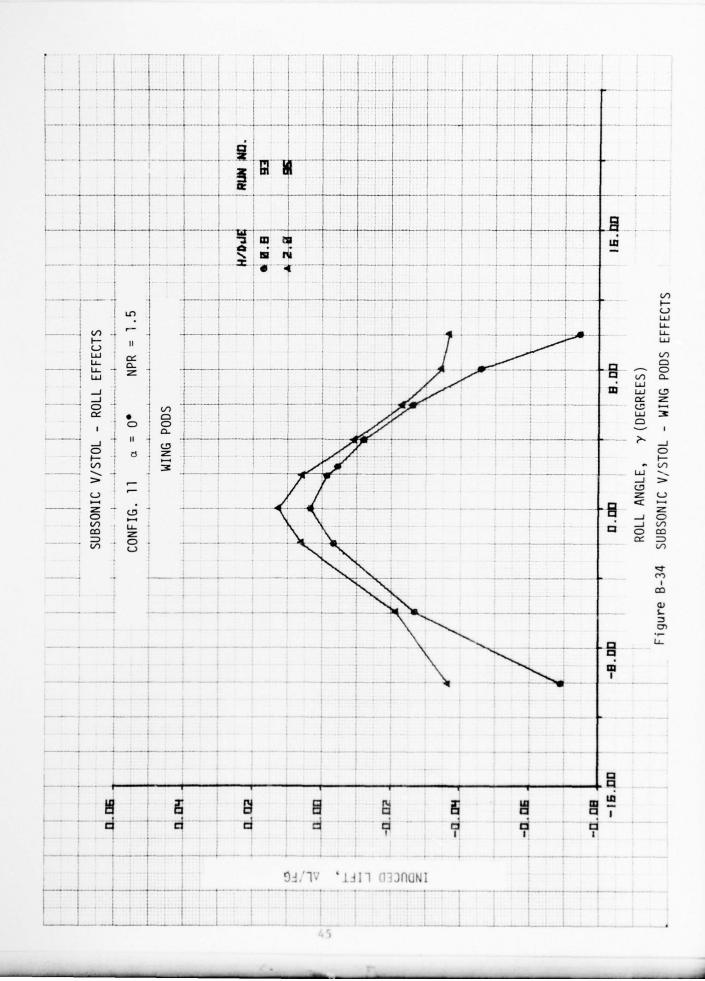


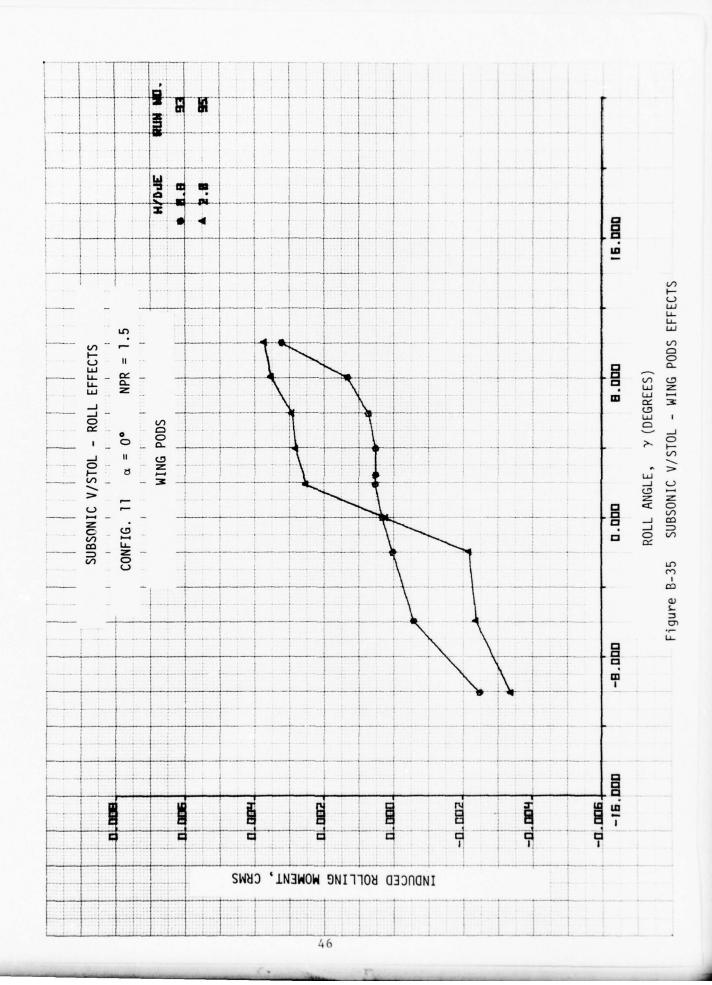


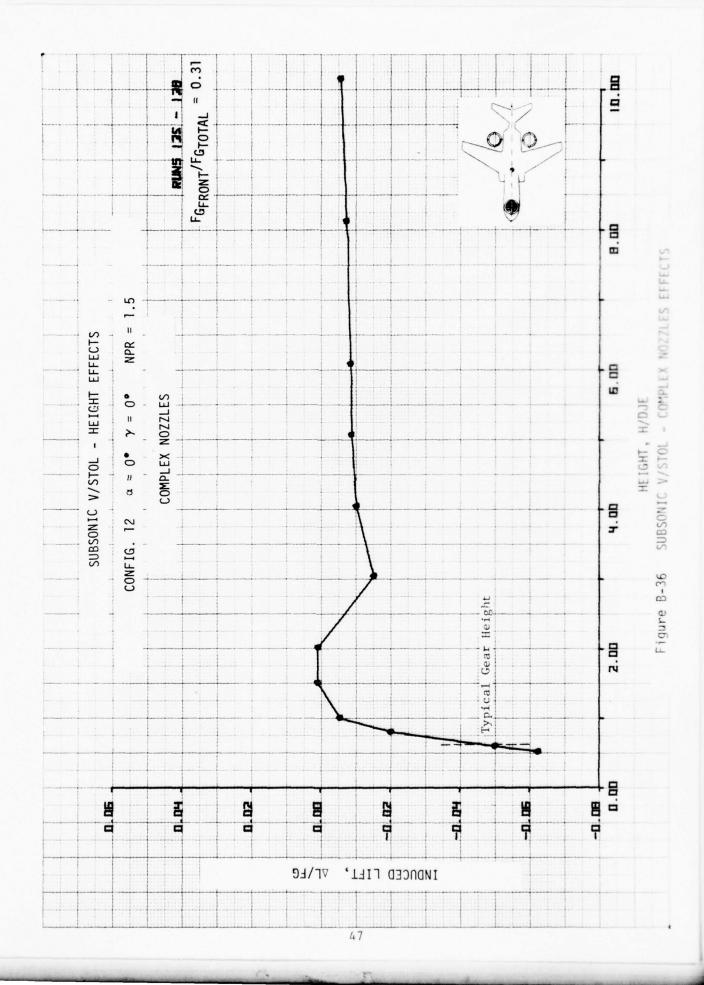


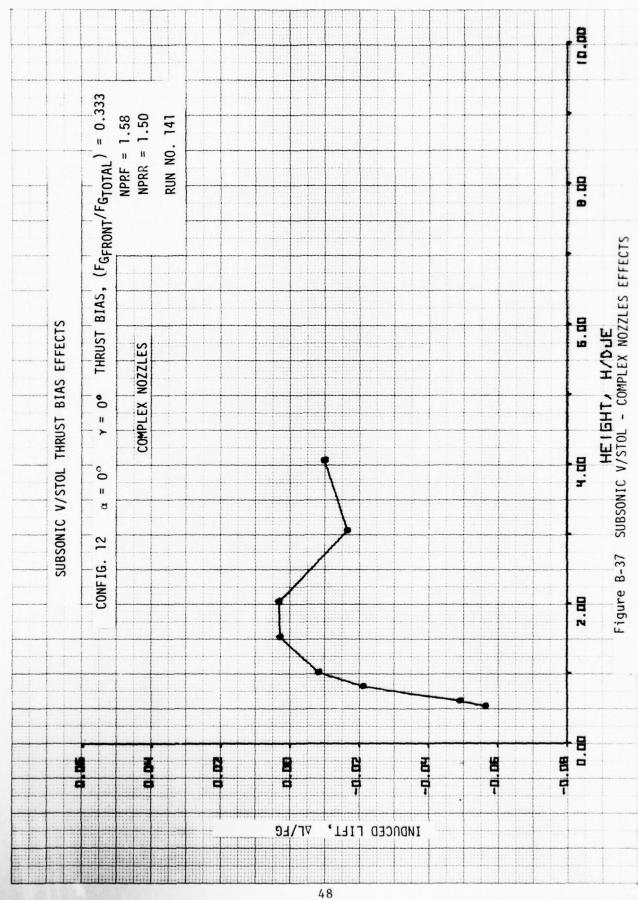


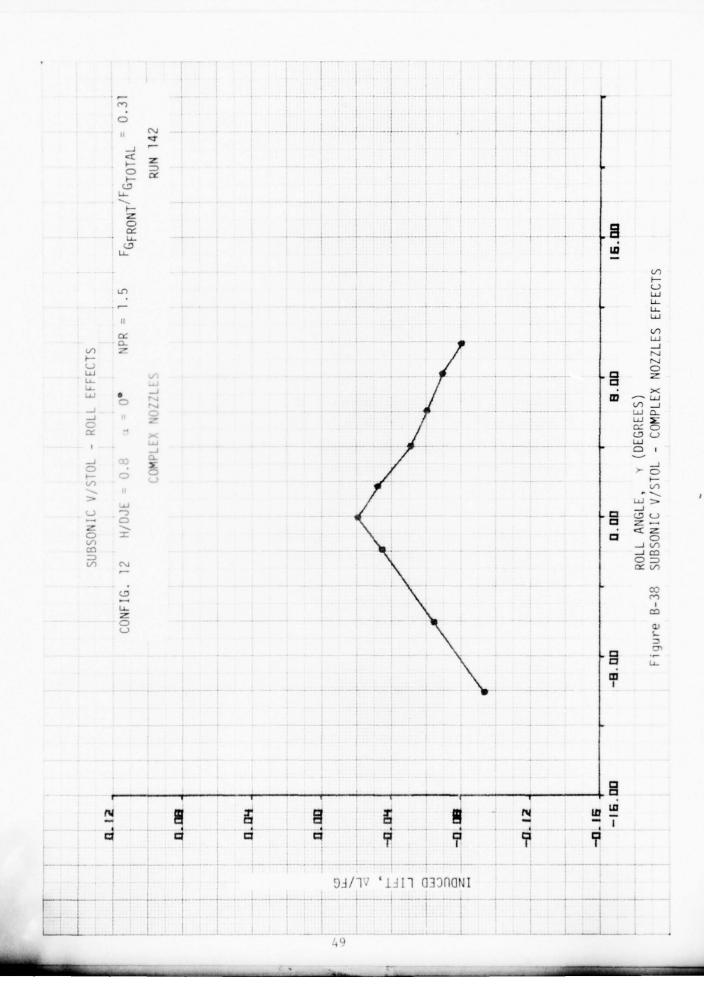


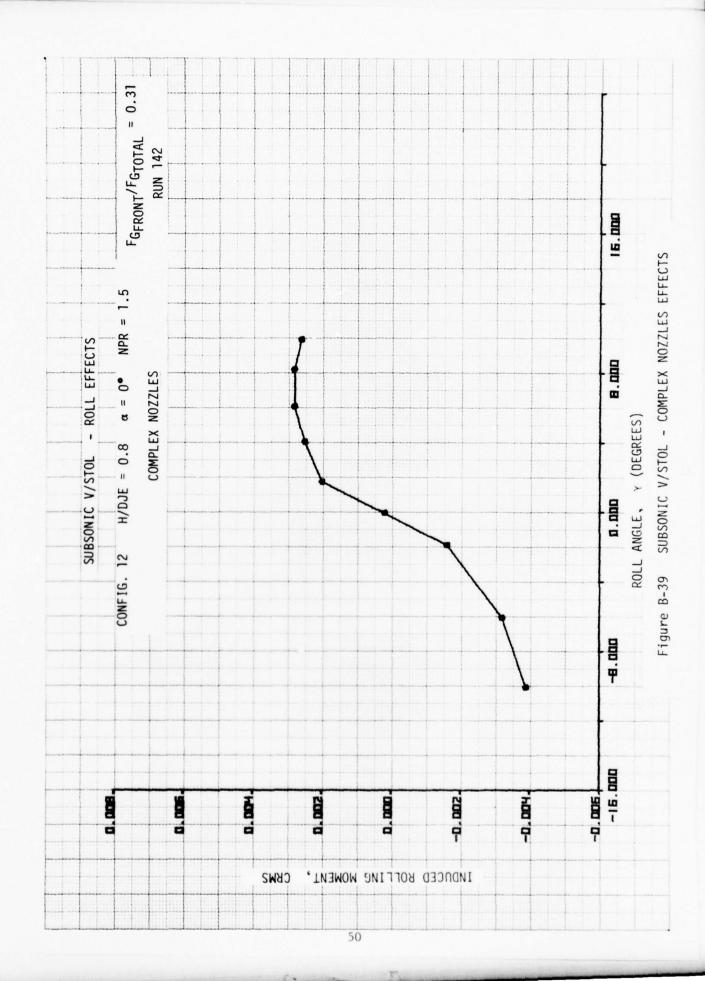


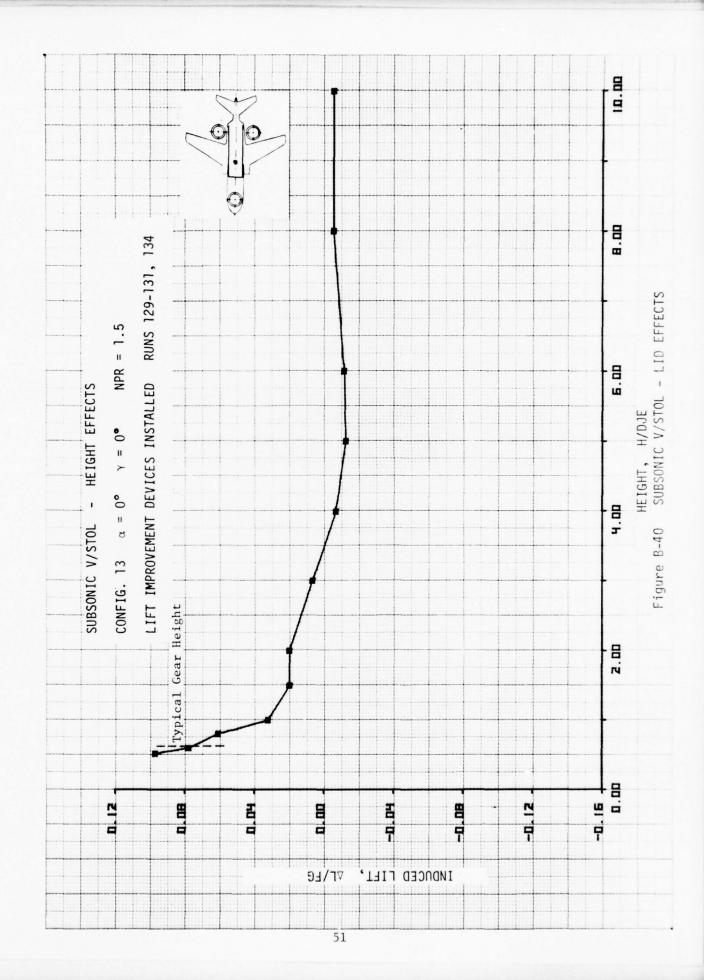


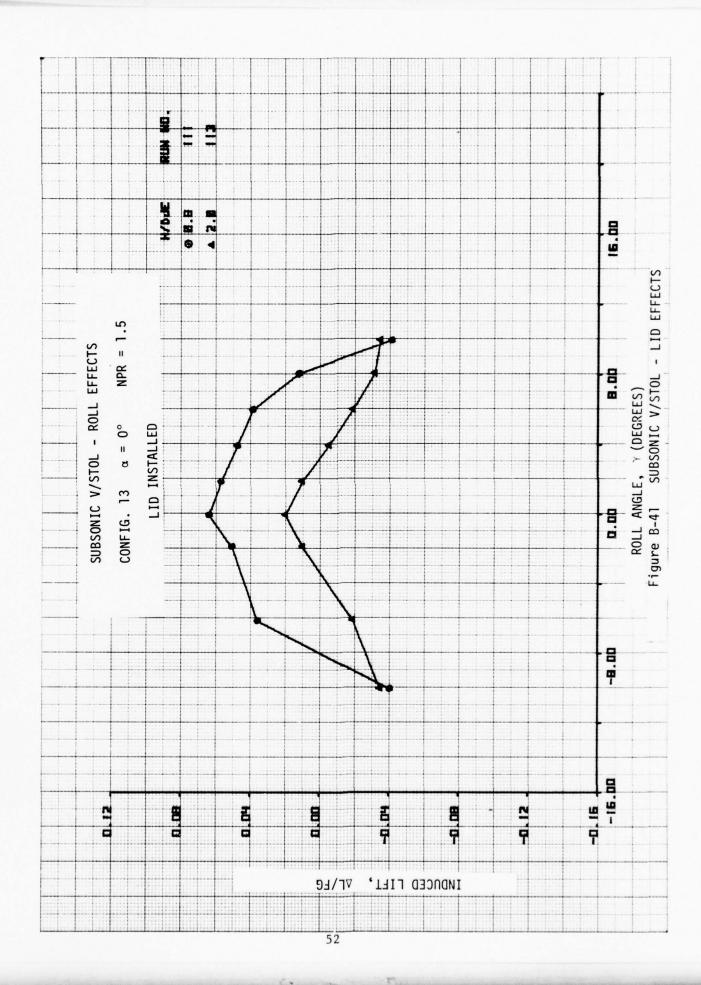


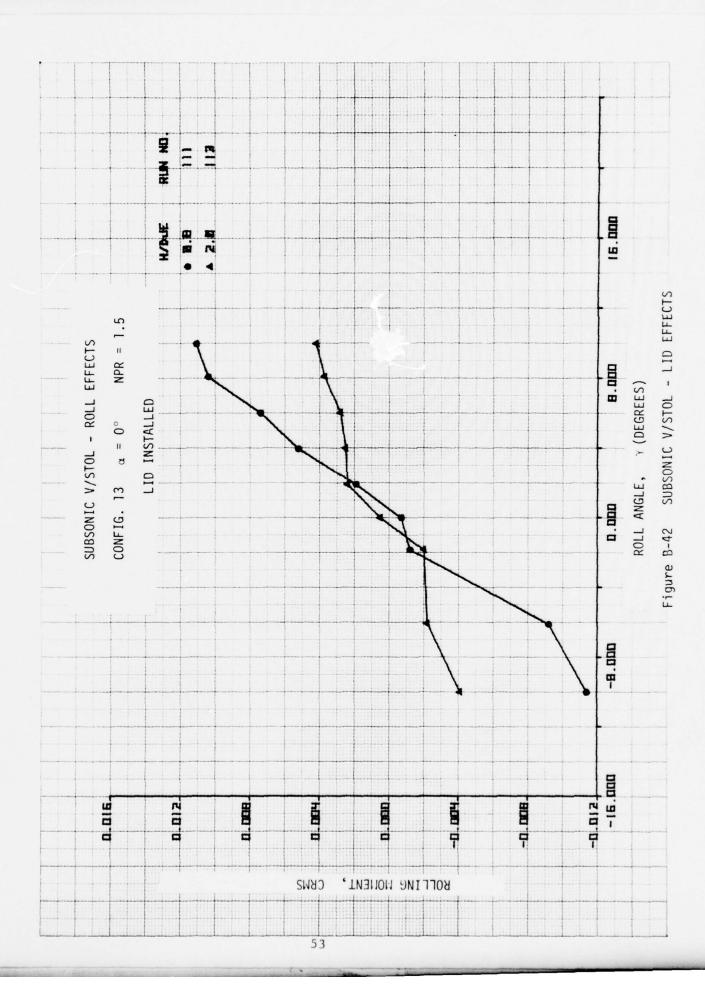


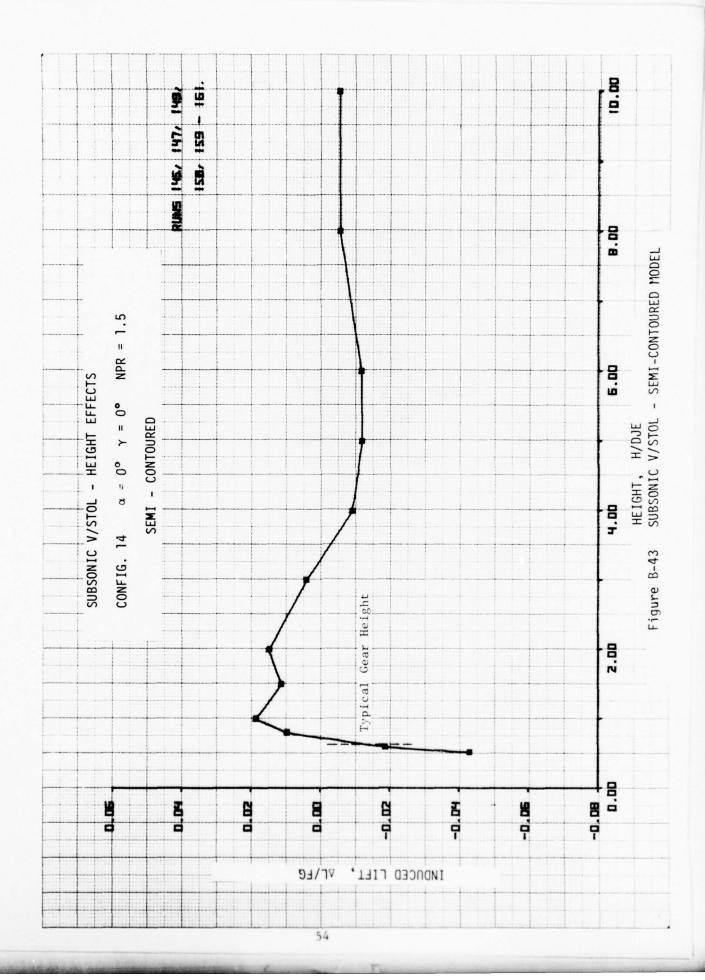


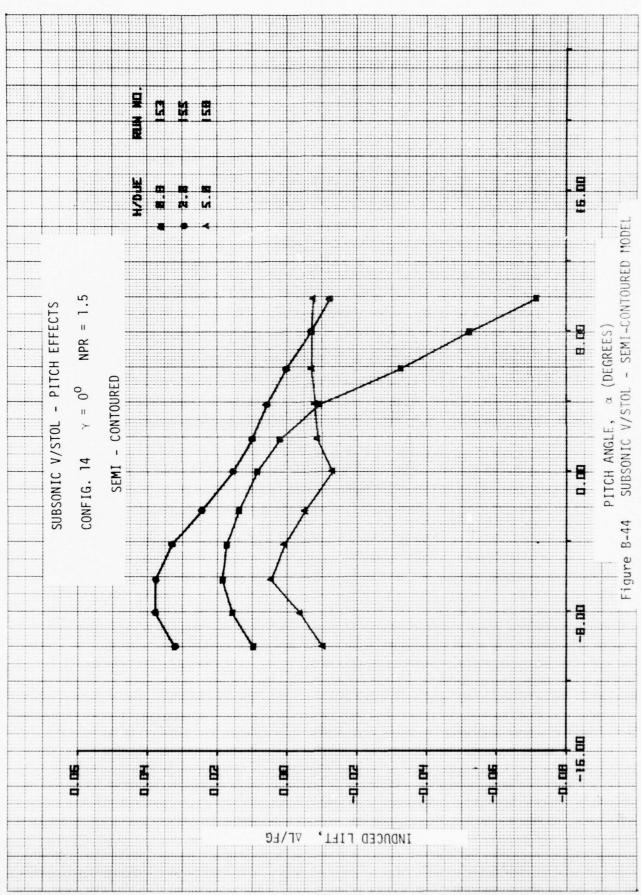


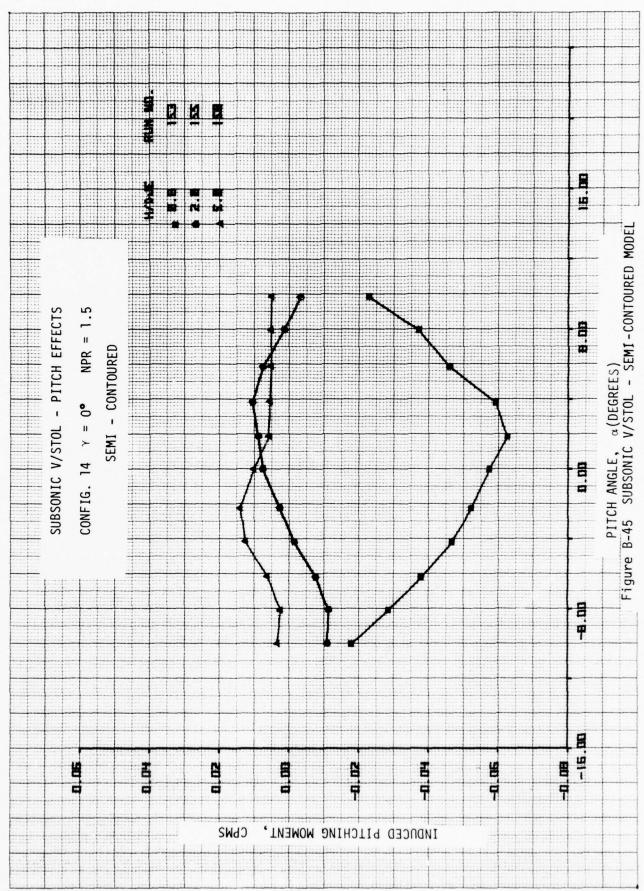


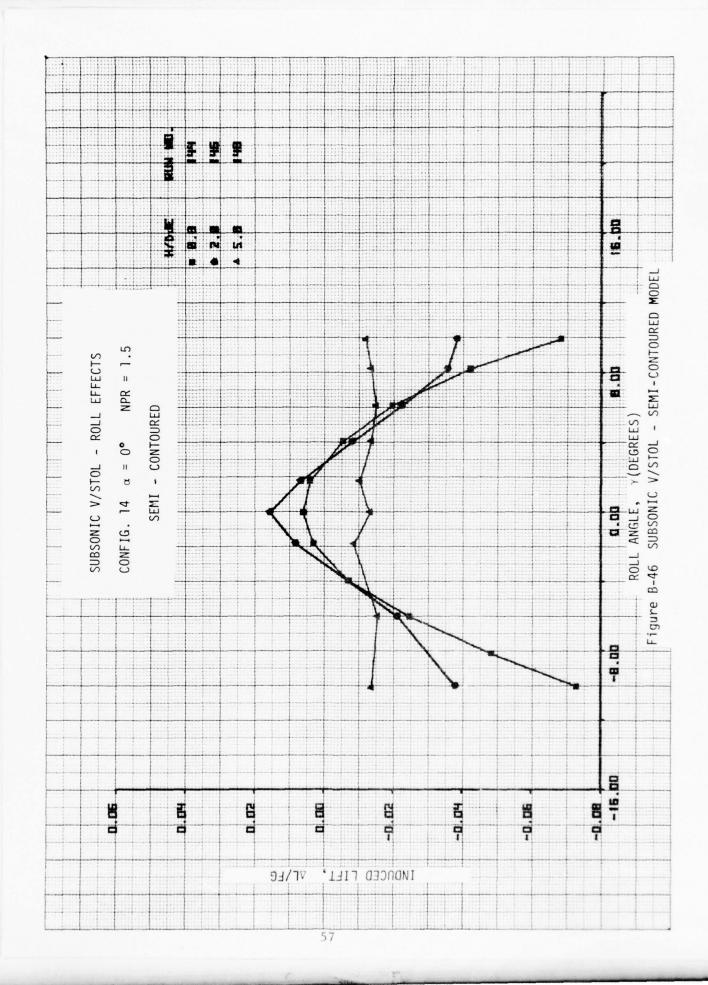


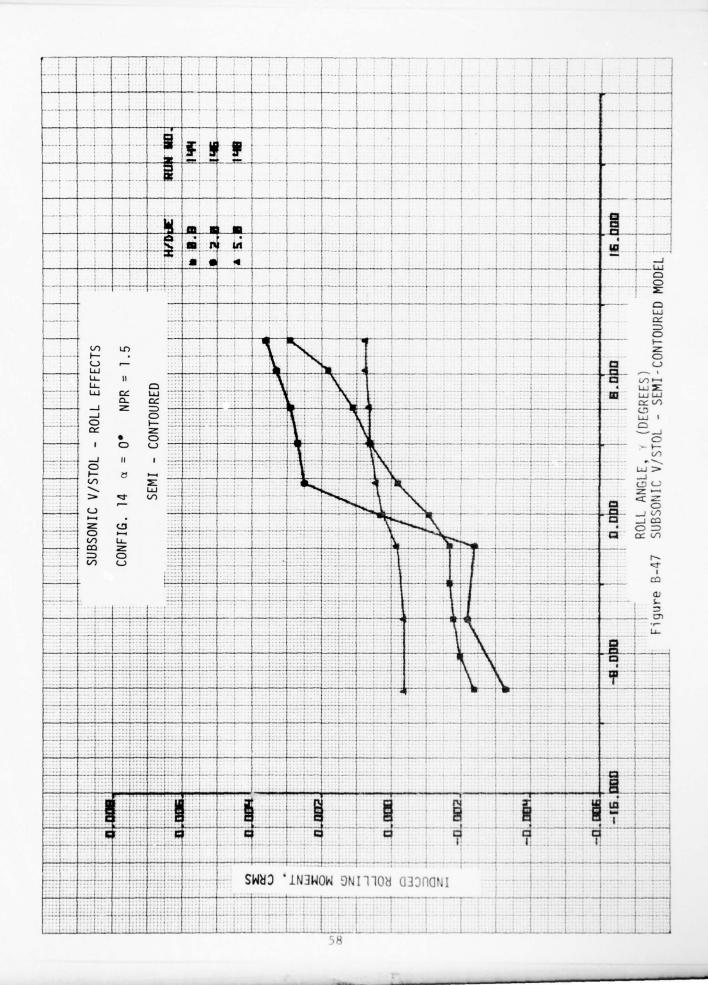


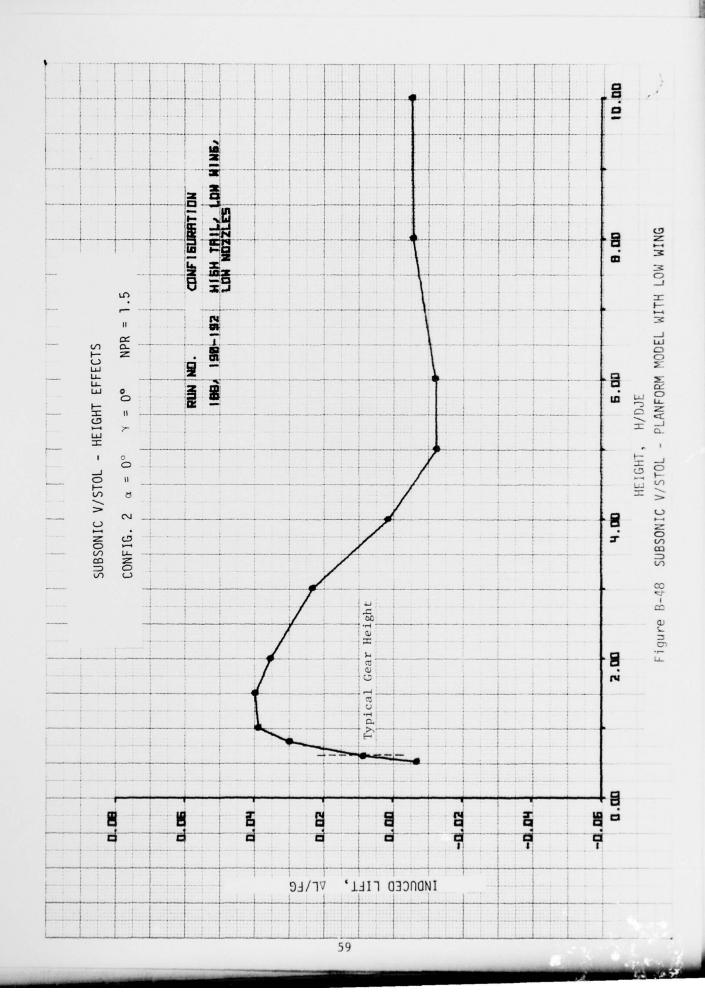


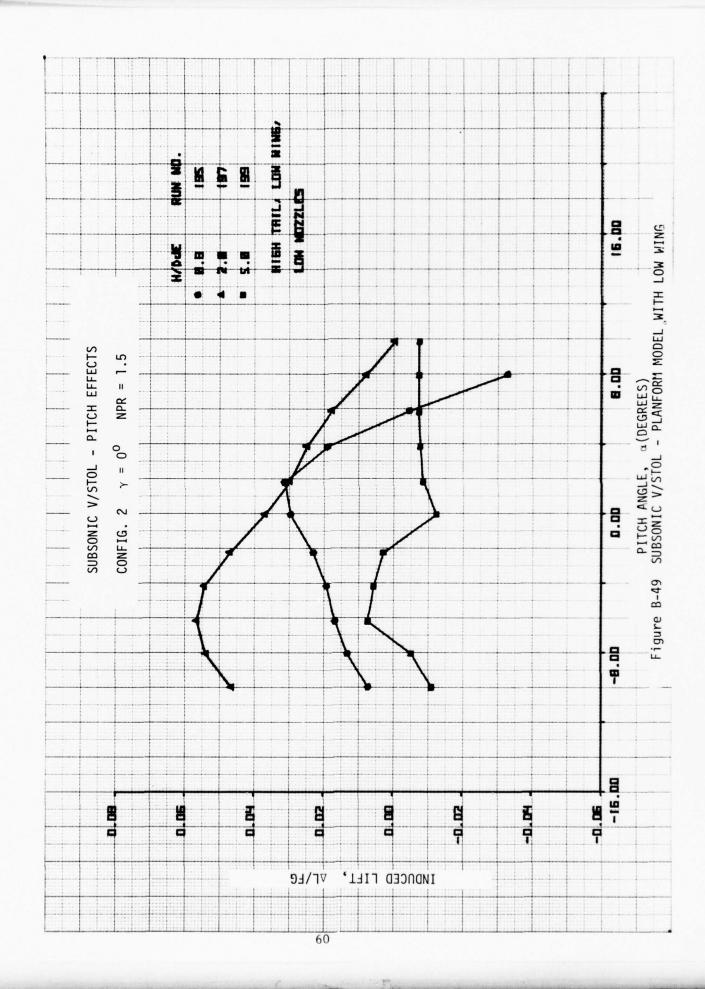


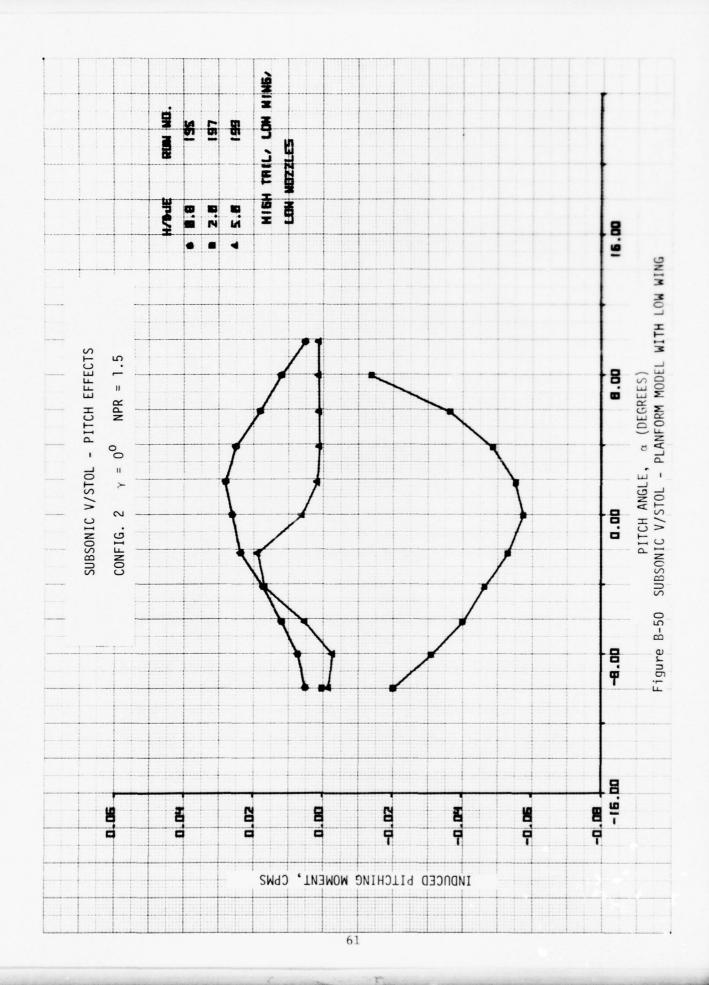


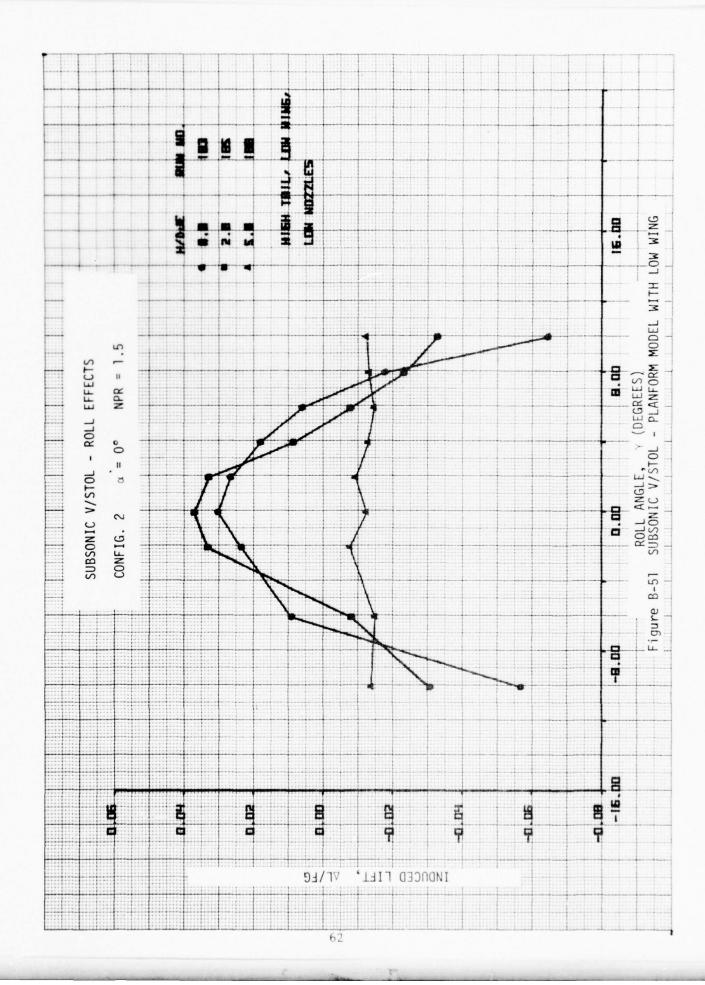


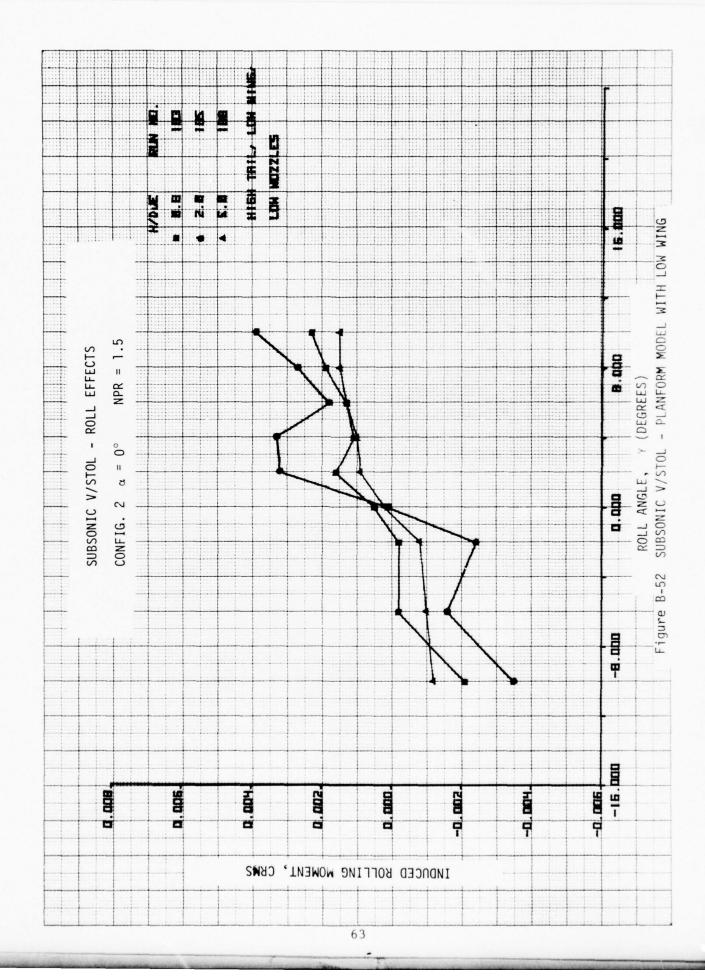


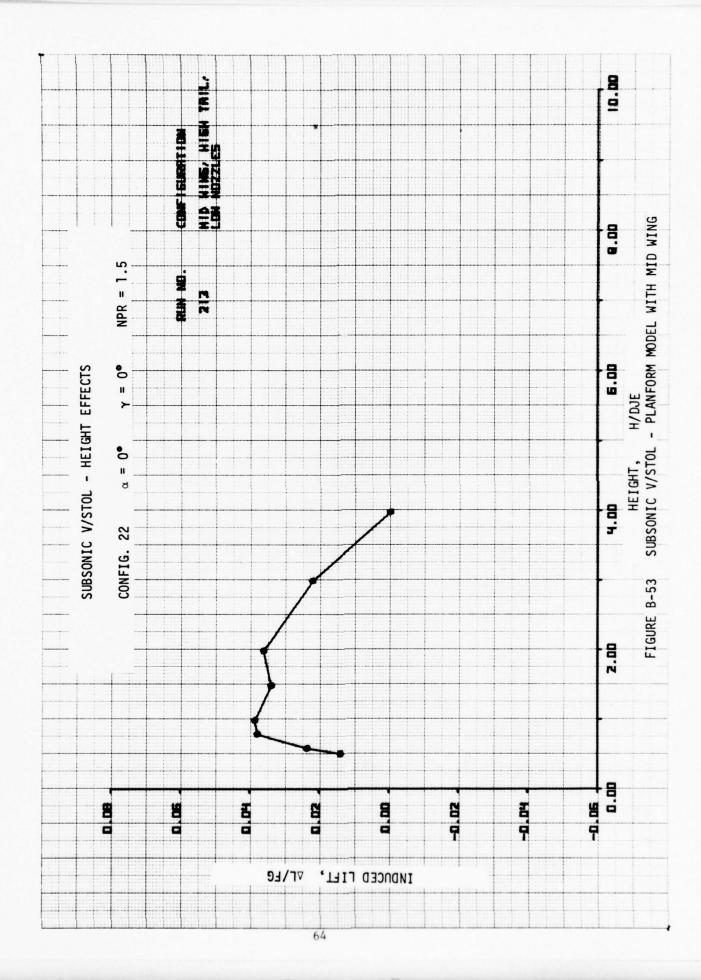


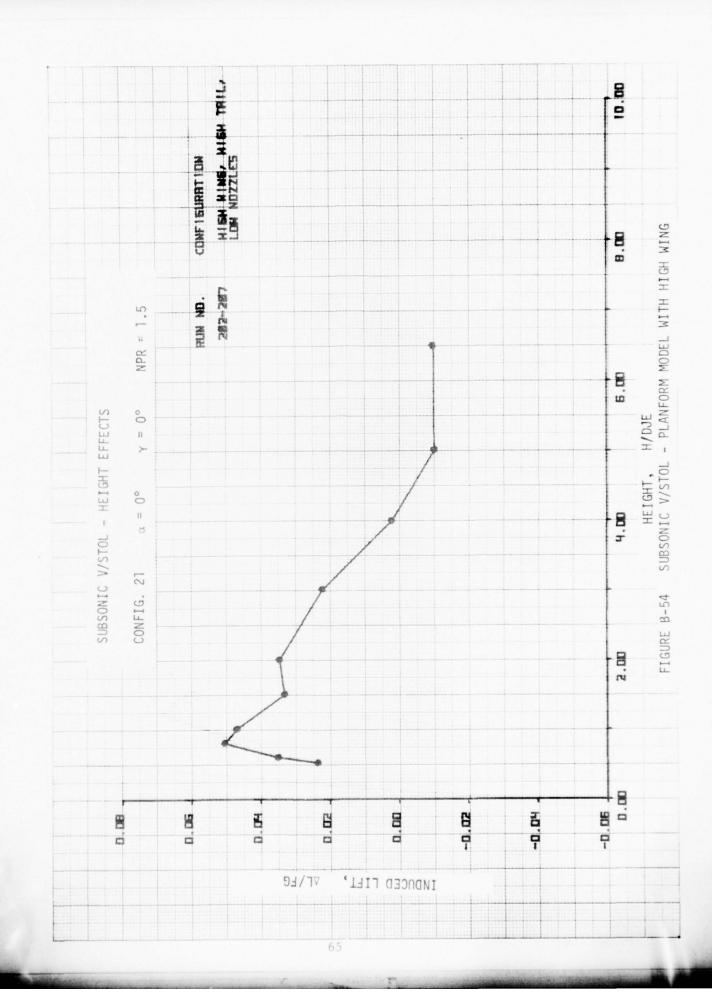


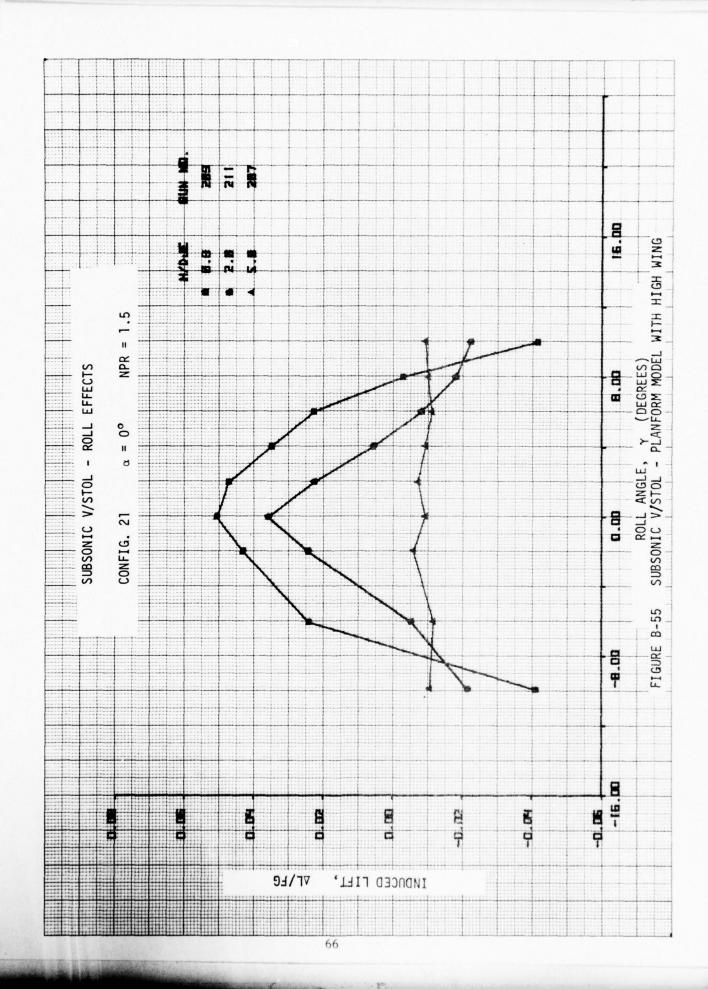


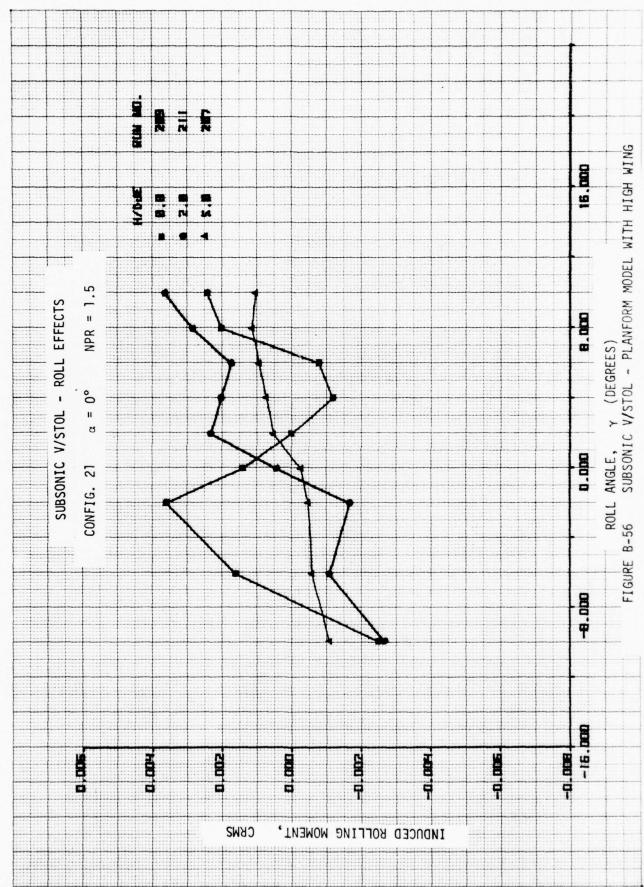


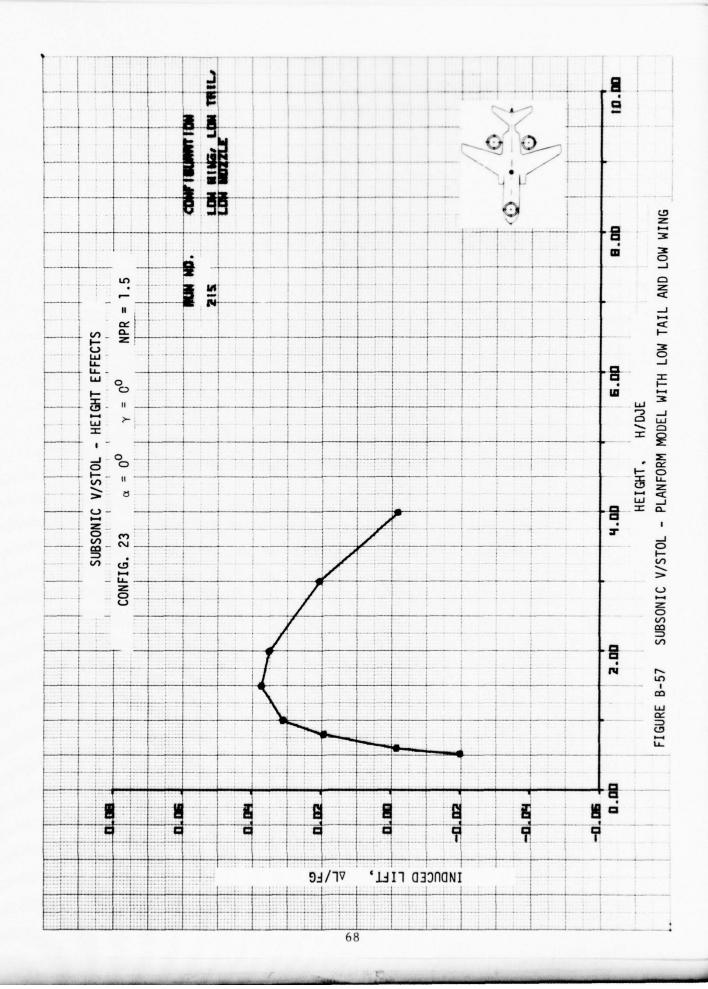


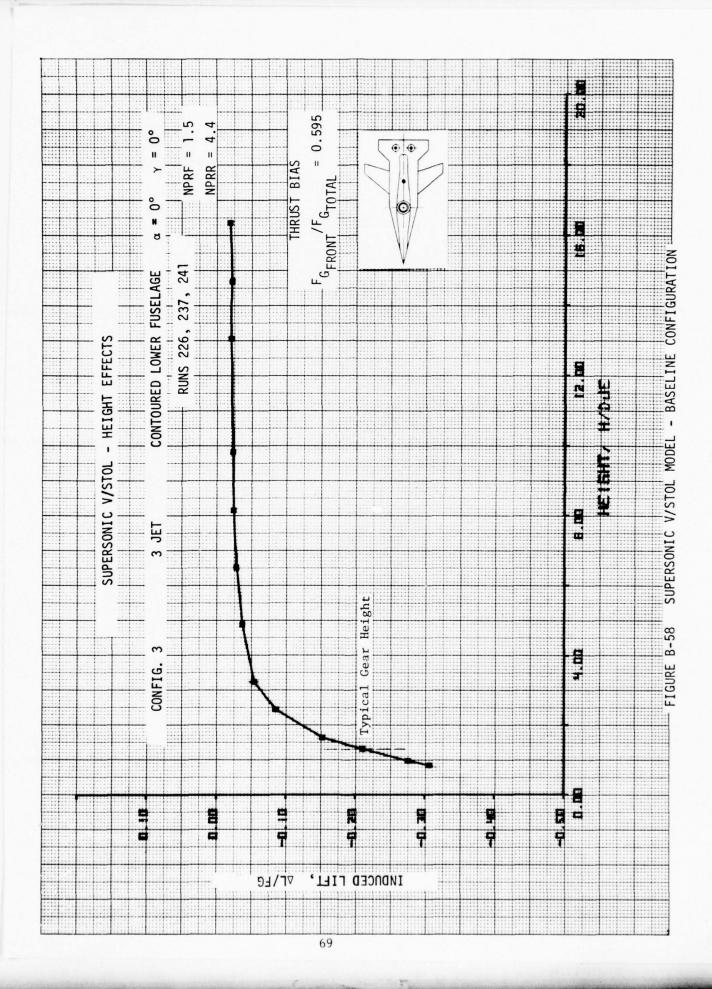


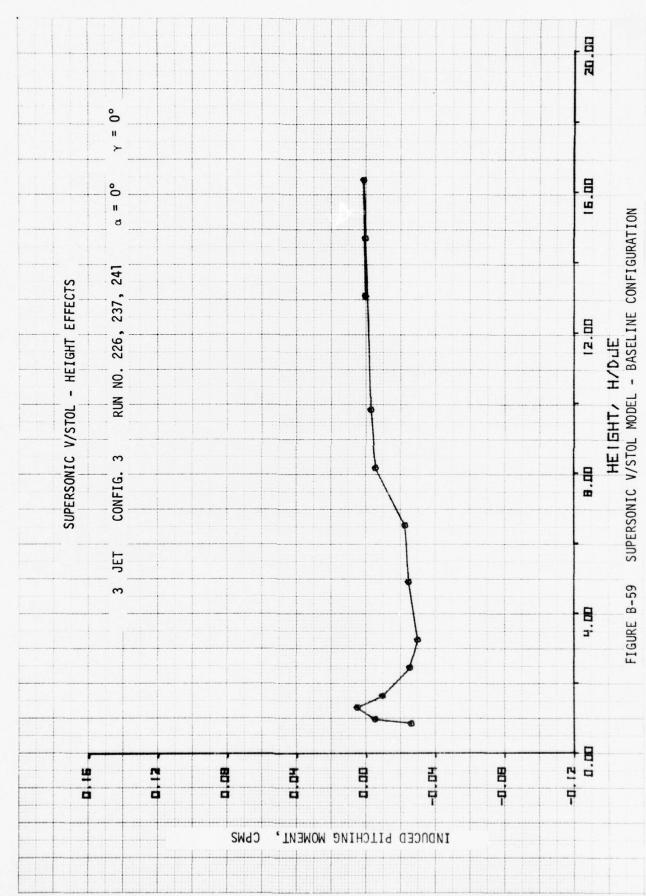


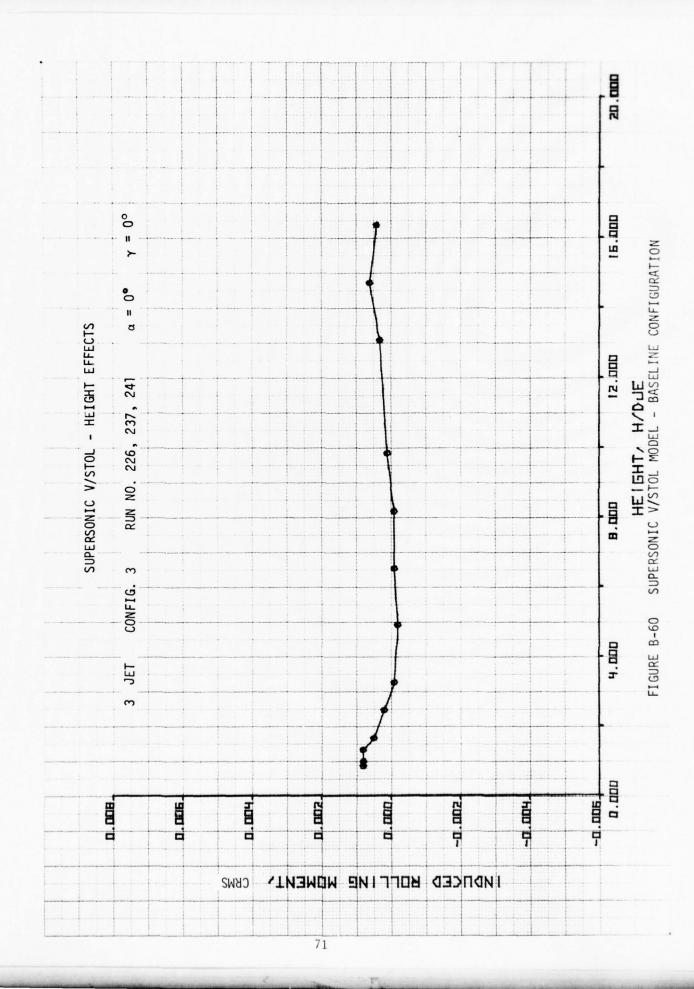


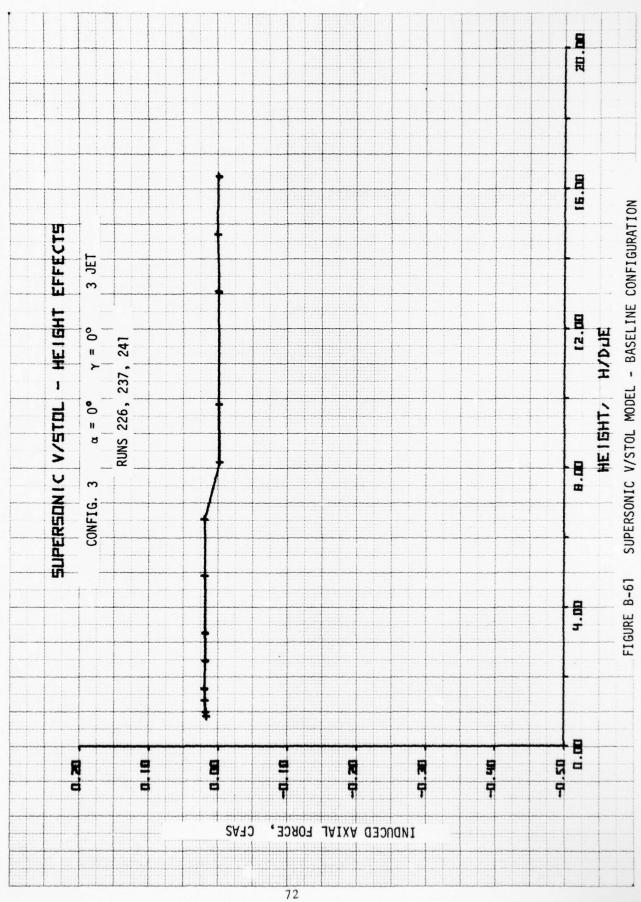


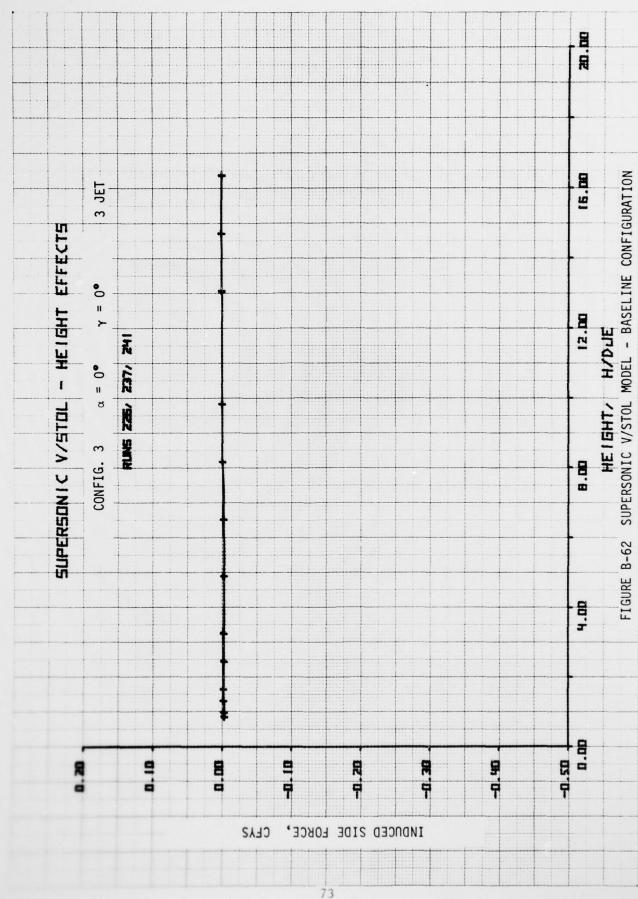


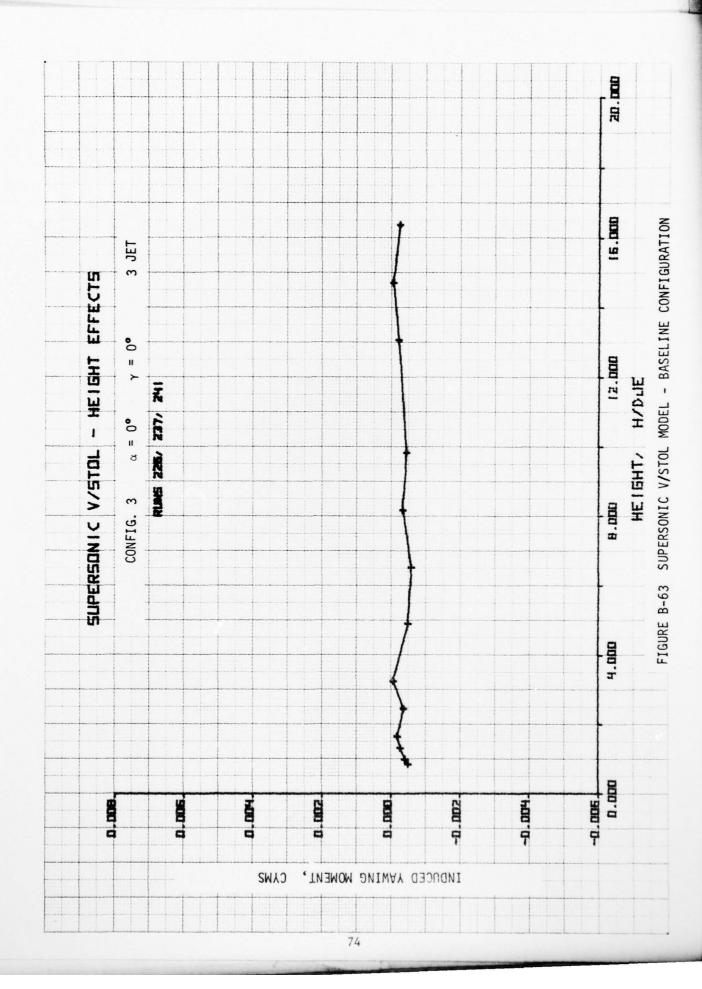


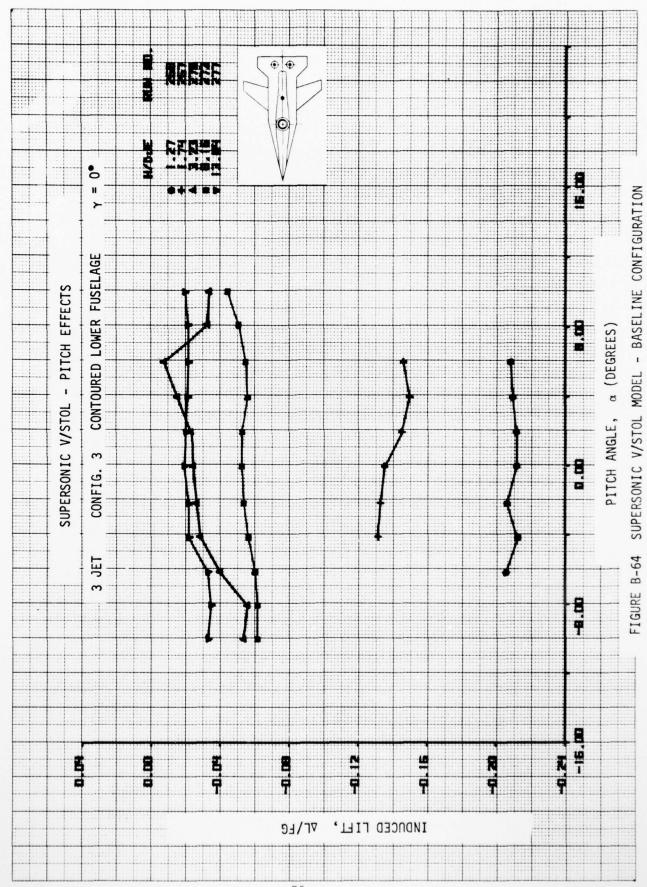


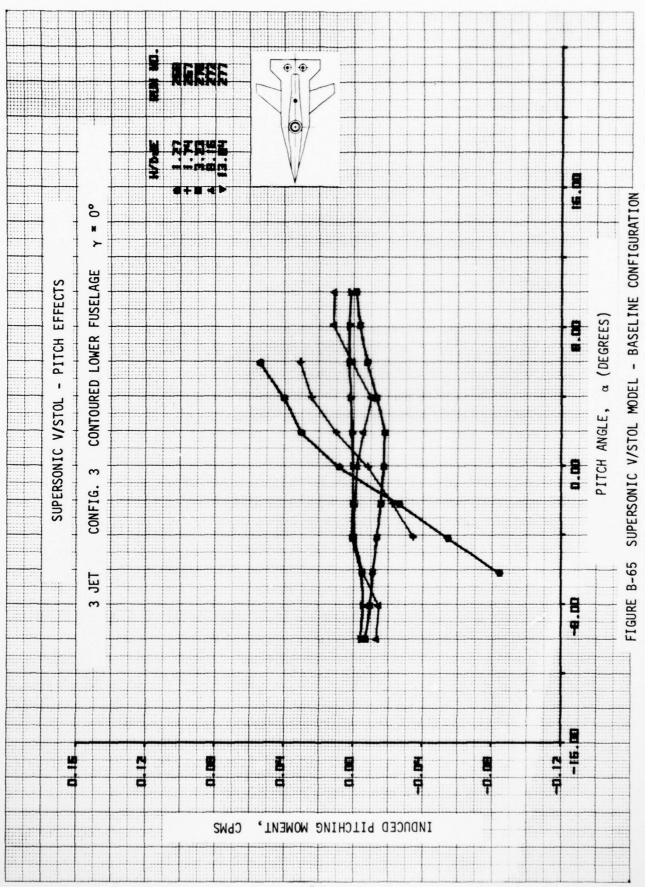


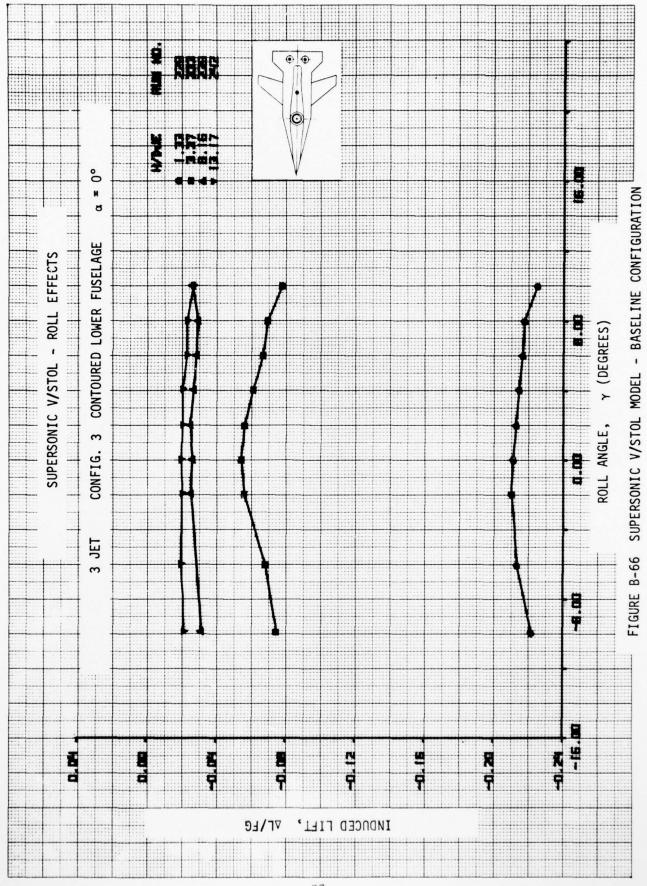












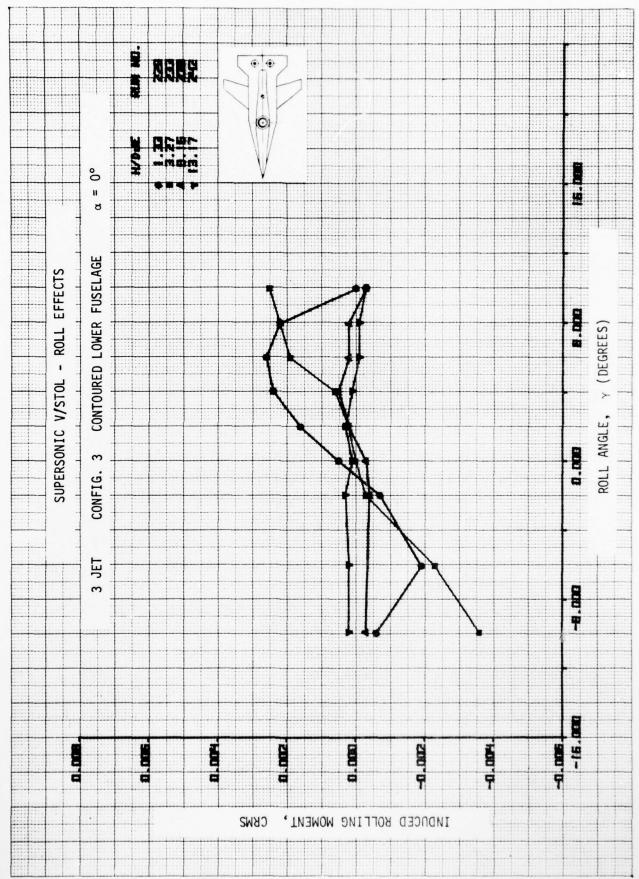
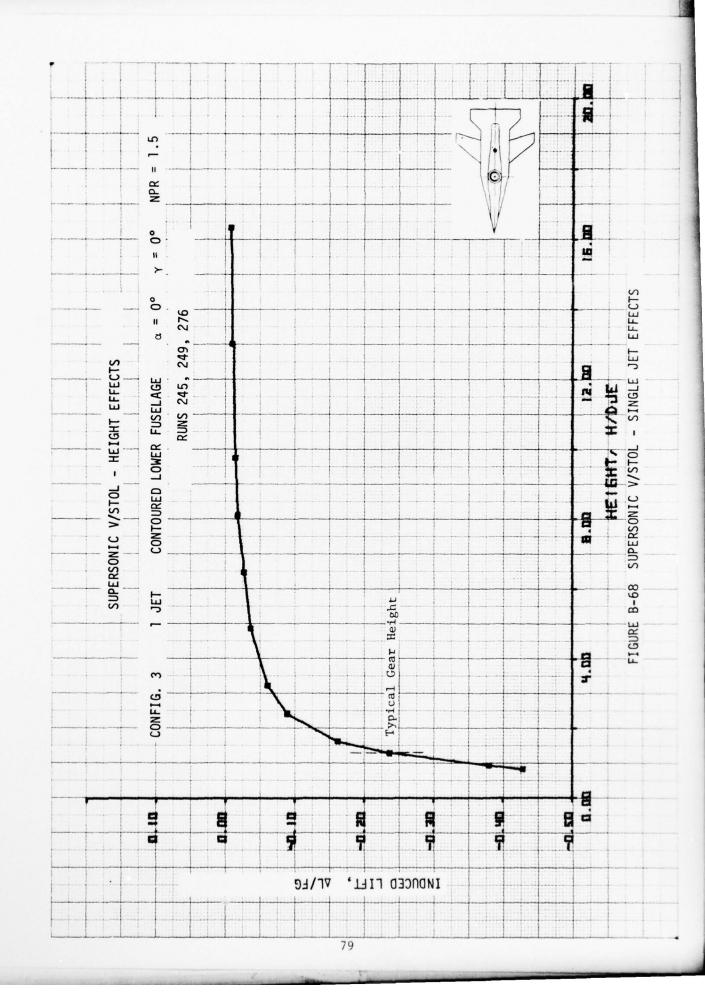
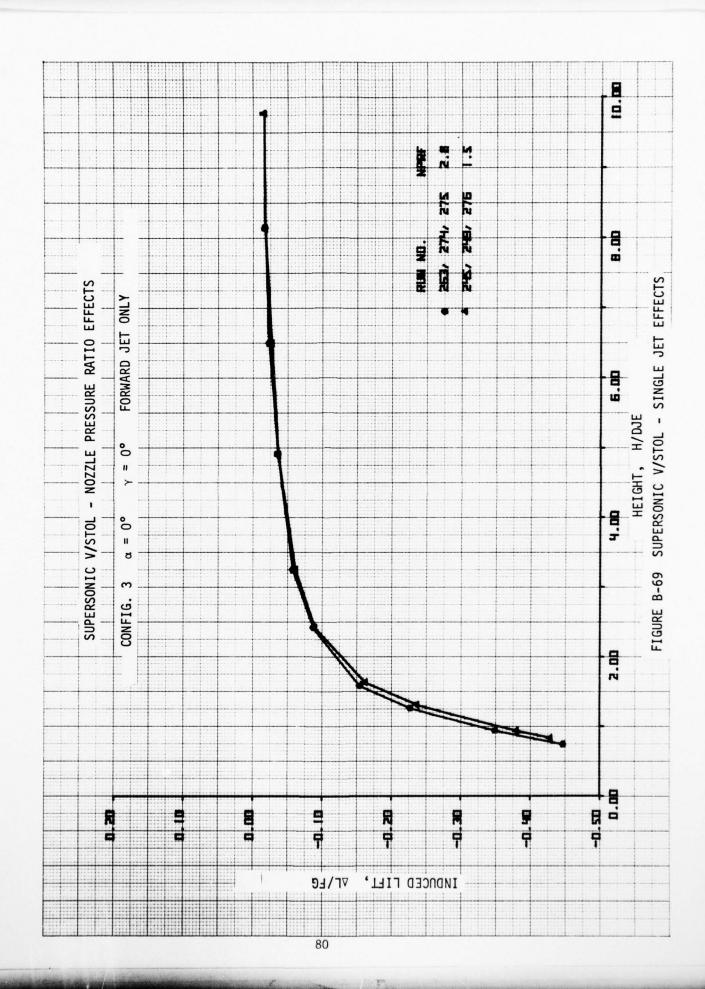
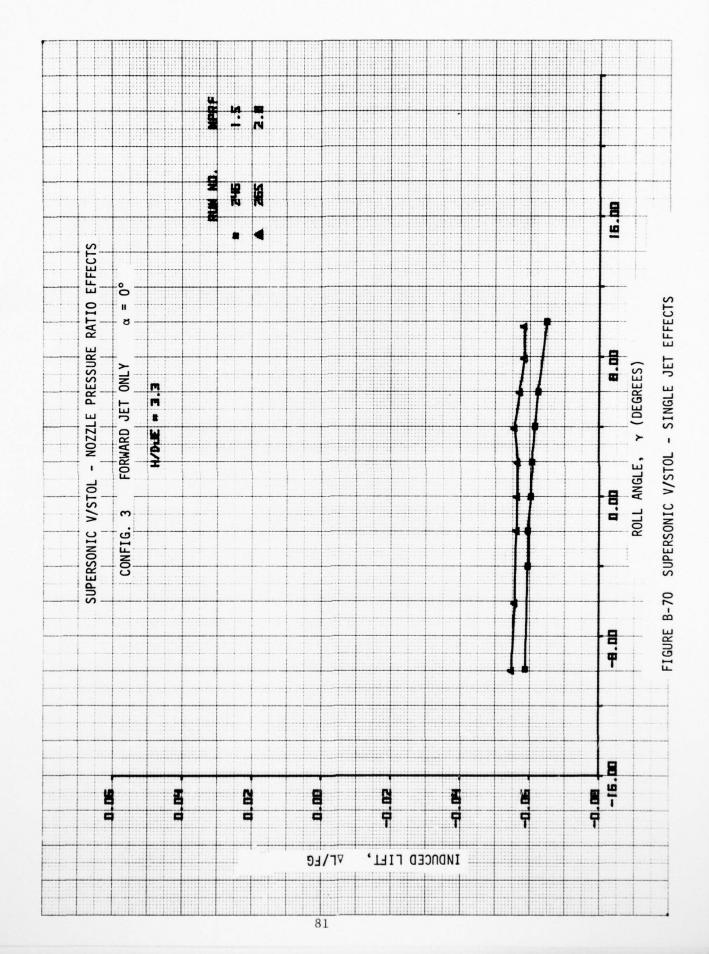


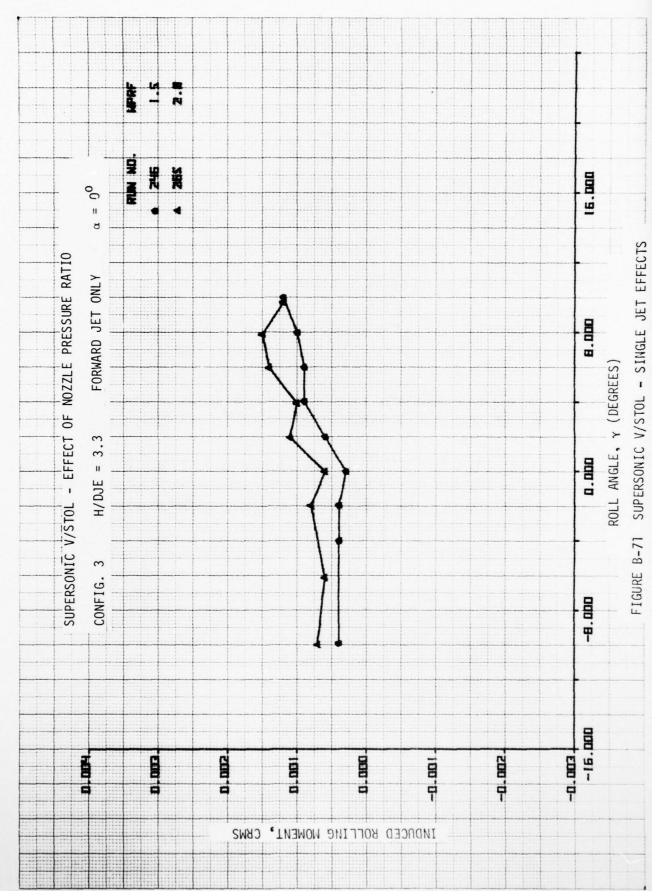
FIGURE B-67 SUPERSONIC V/STOL MODEL - BASELINE CONFIGURATION

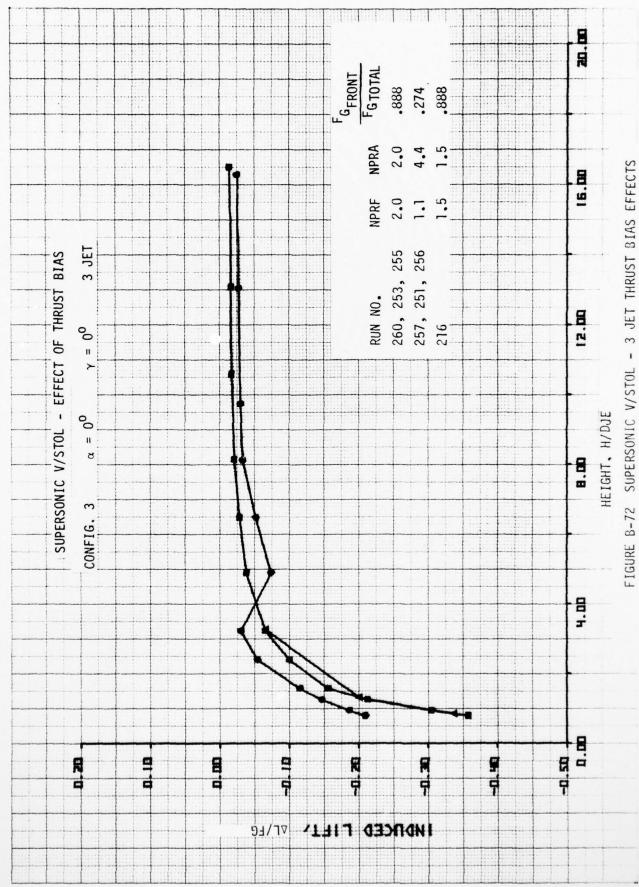
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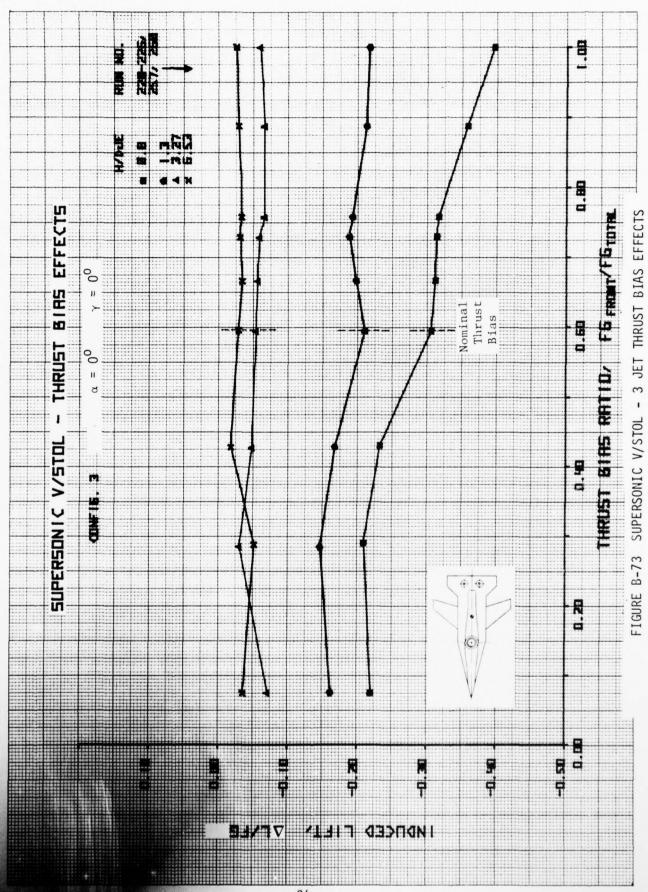


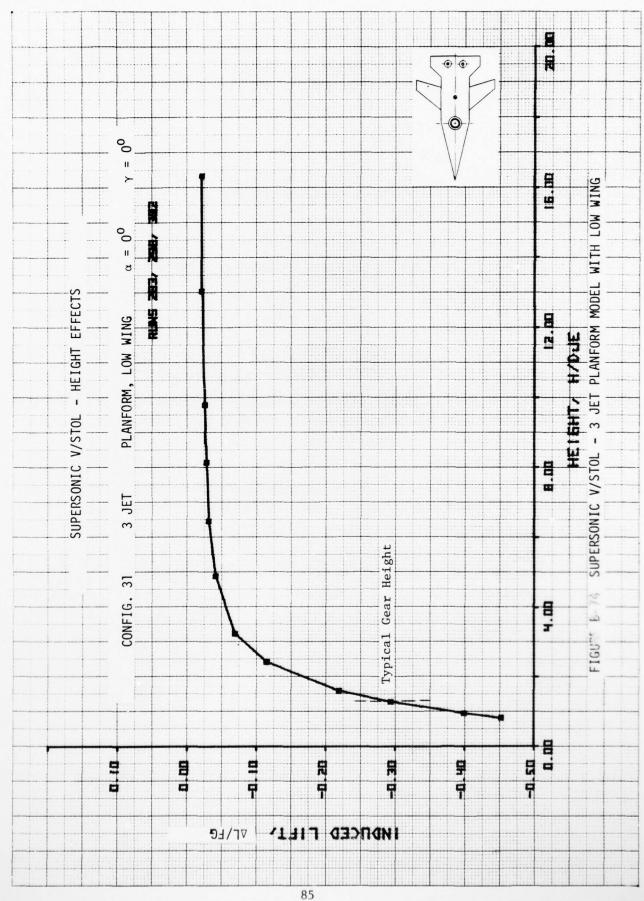


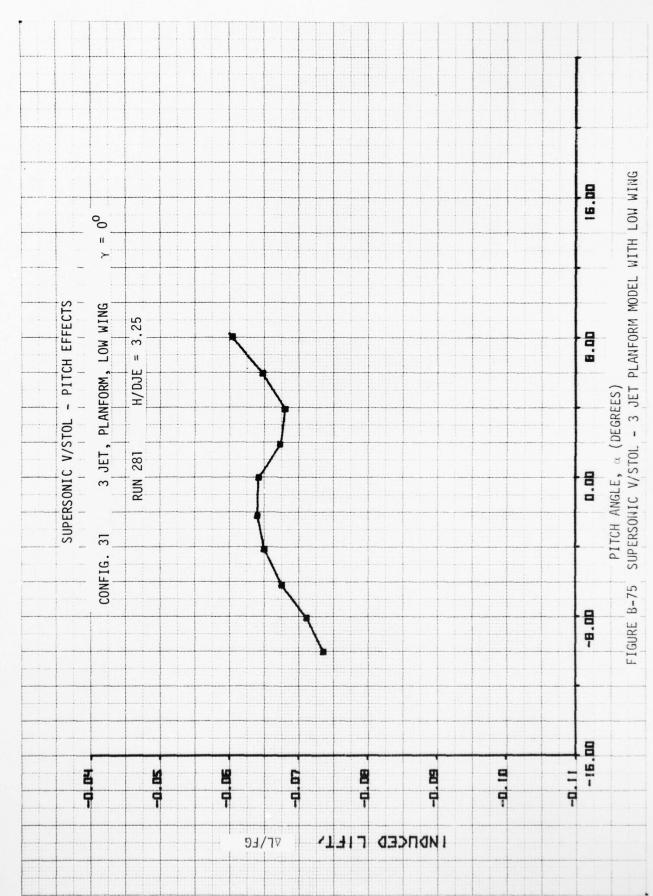


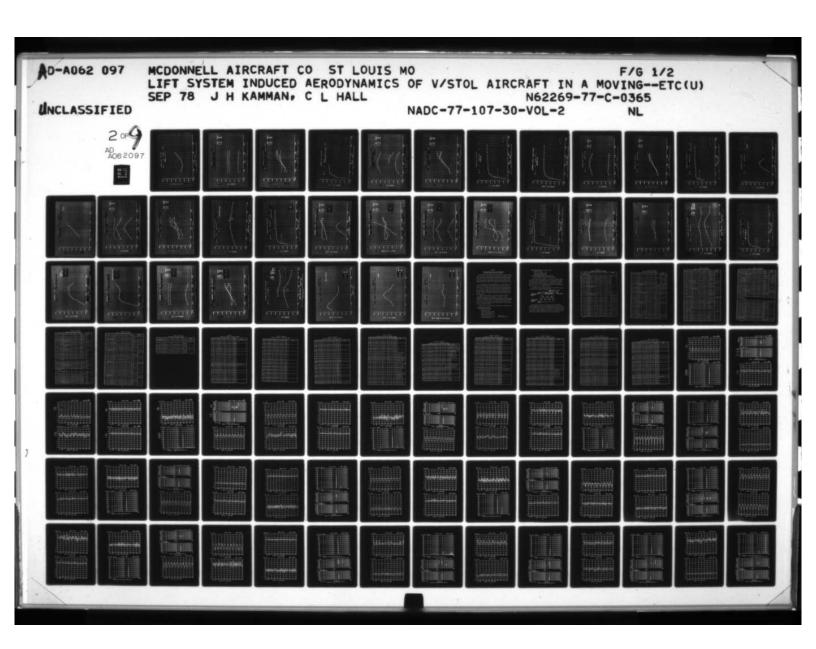


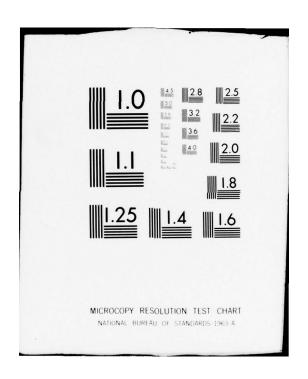


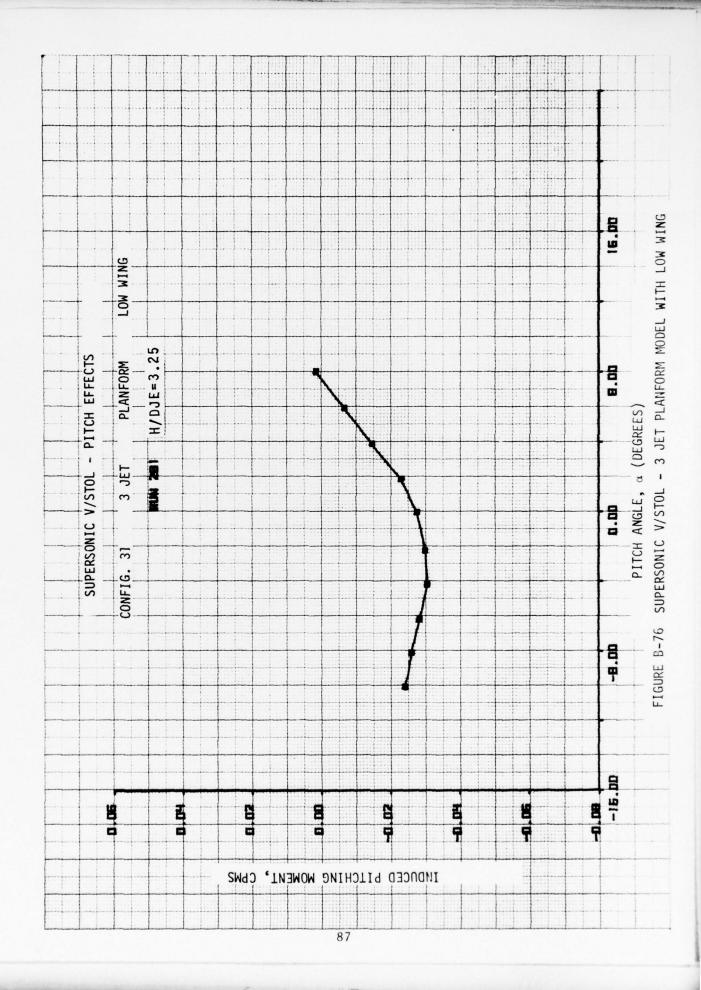


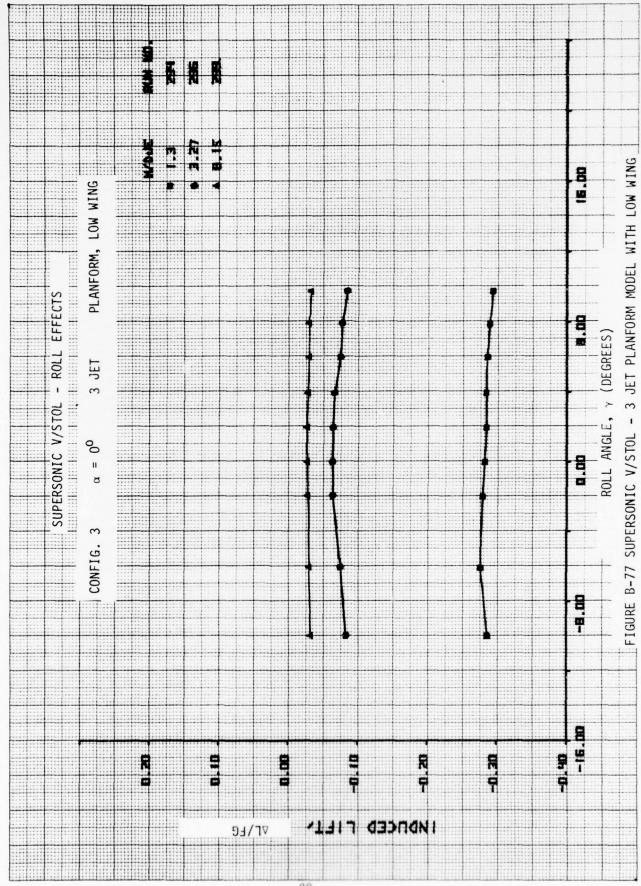


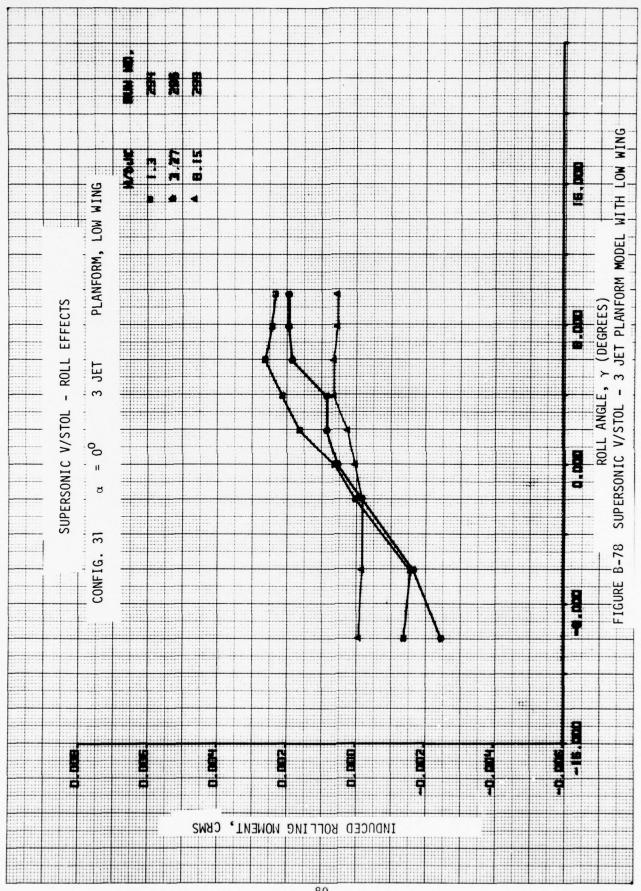


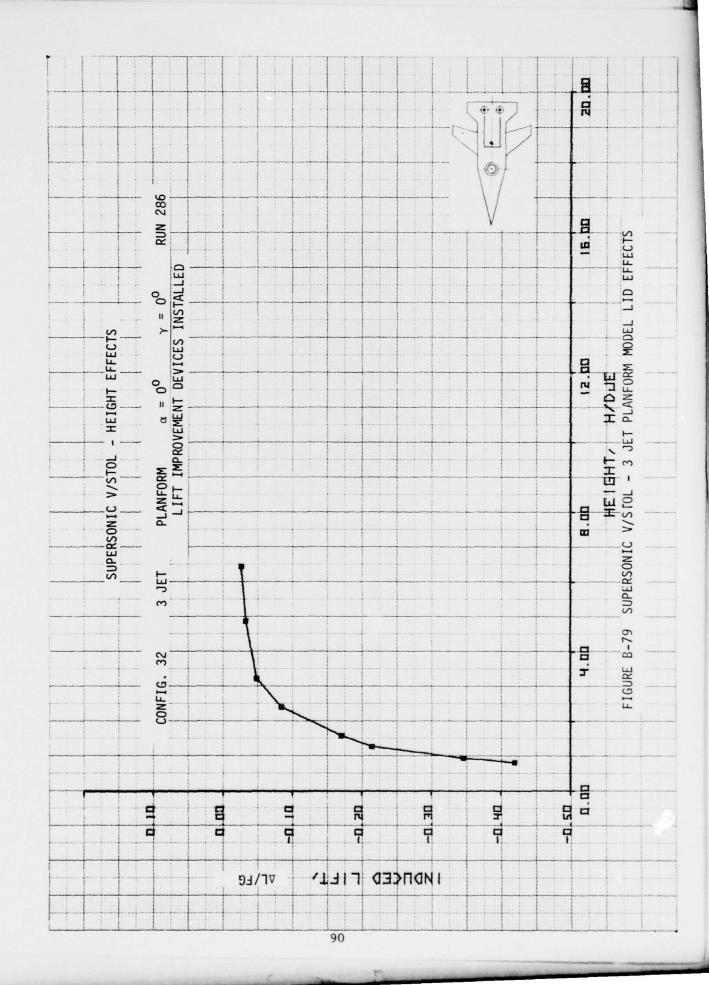


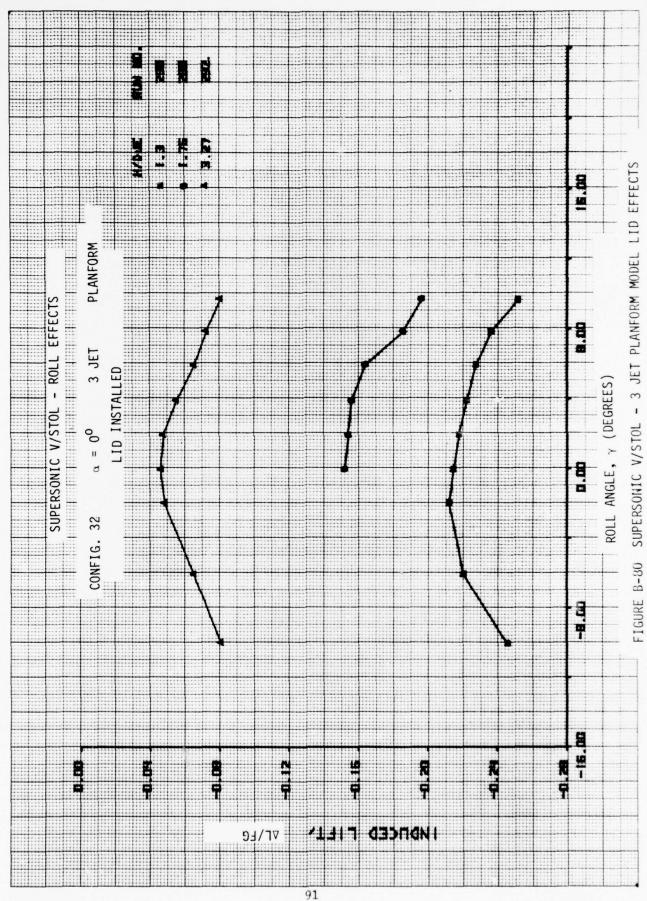


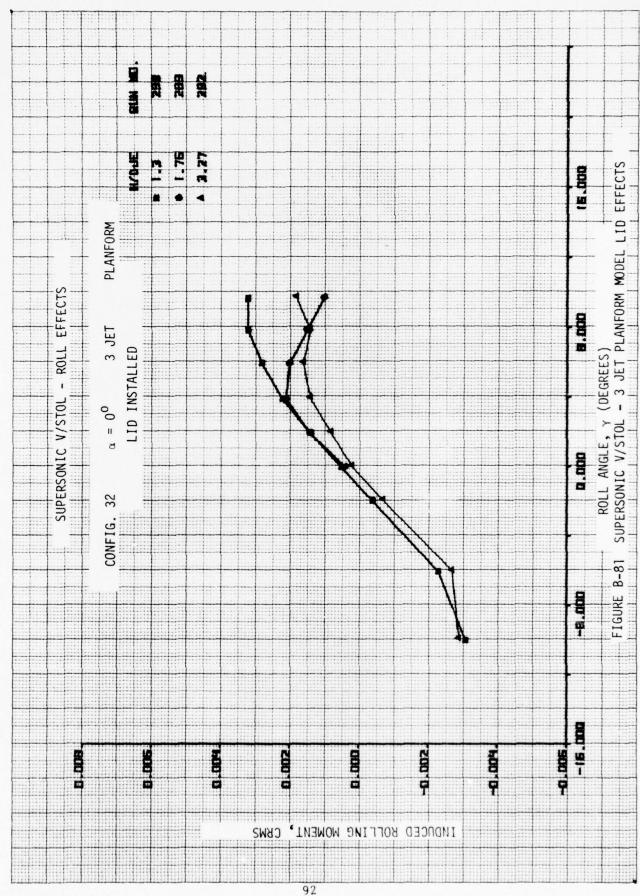


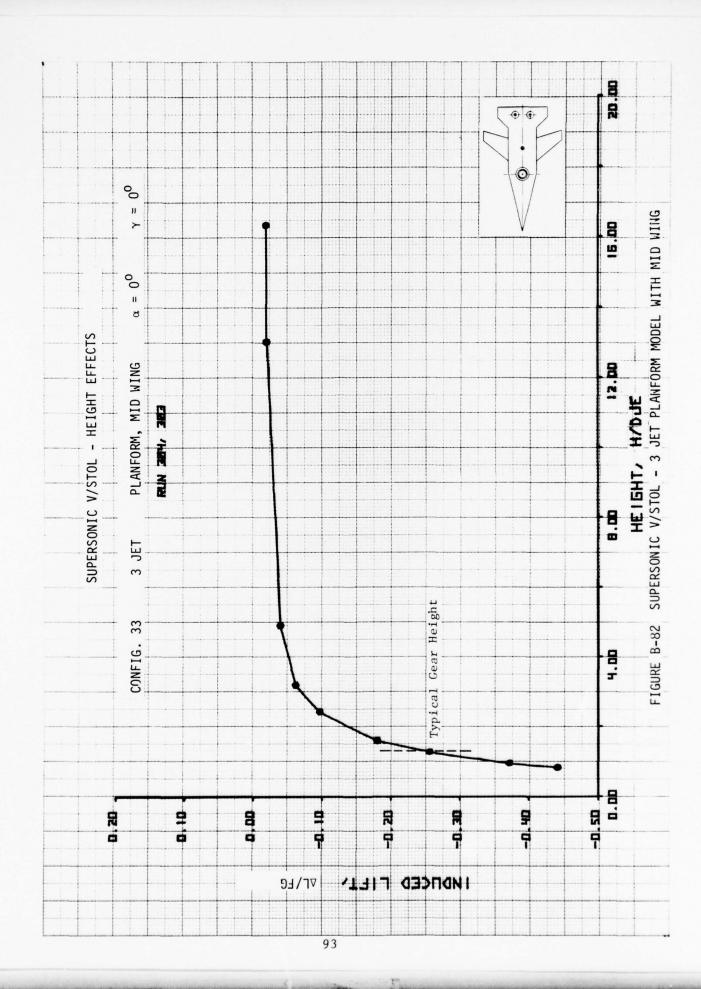


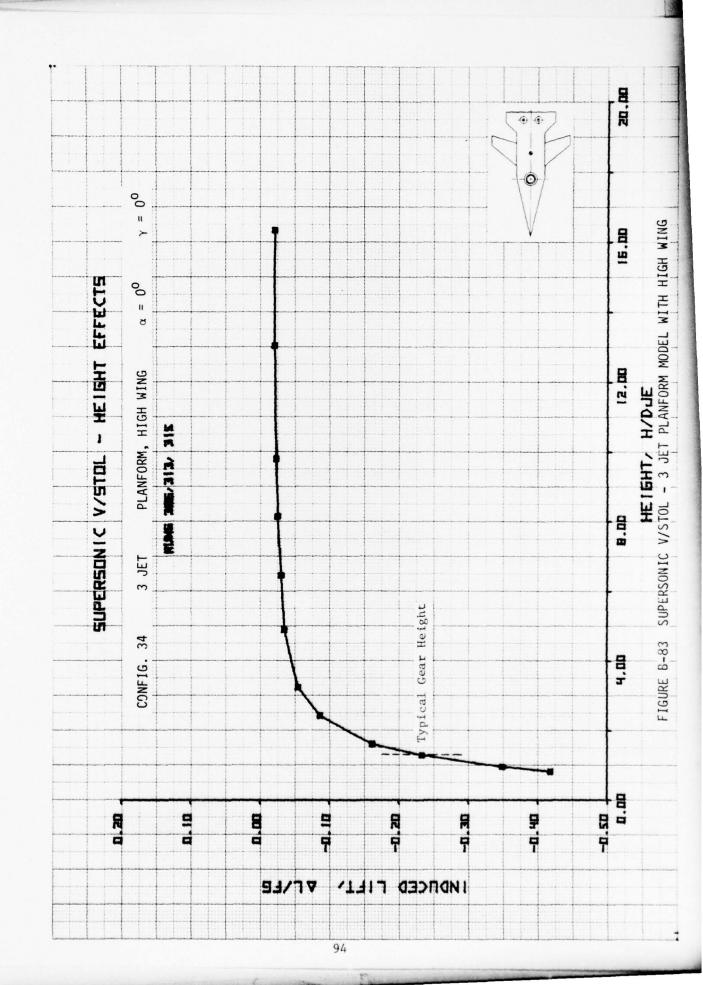


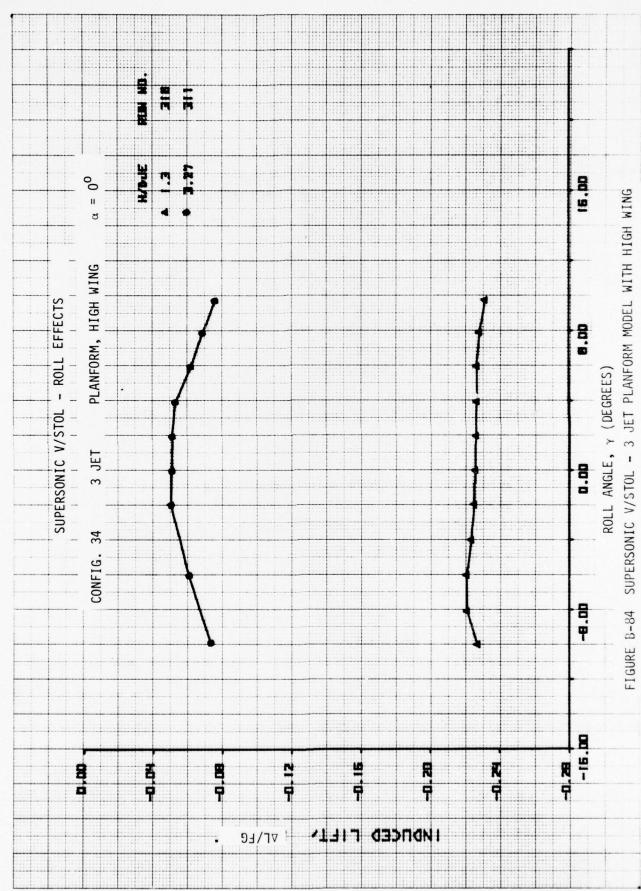


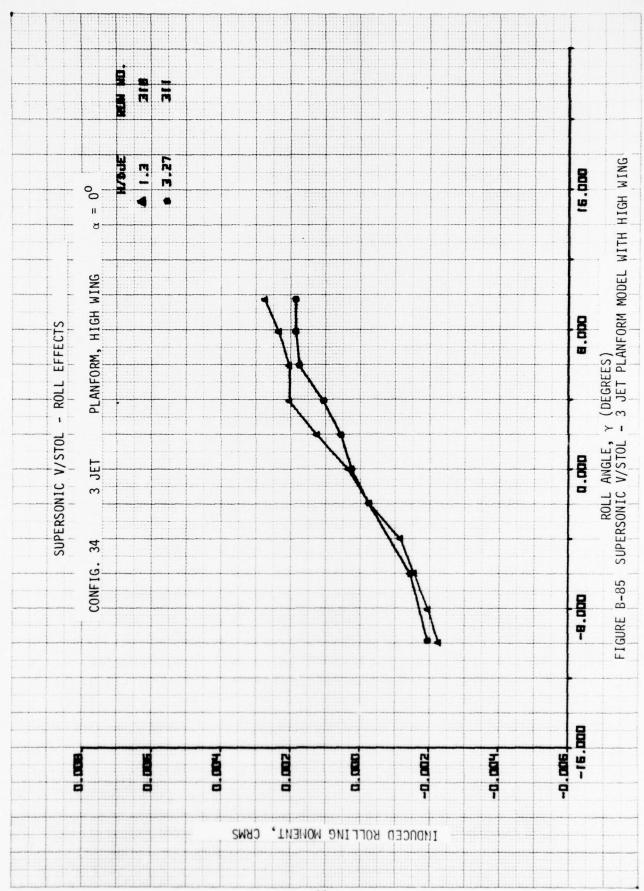


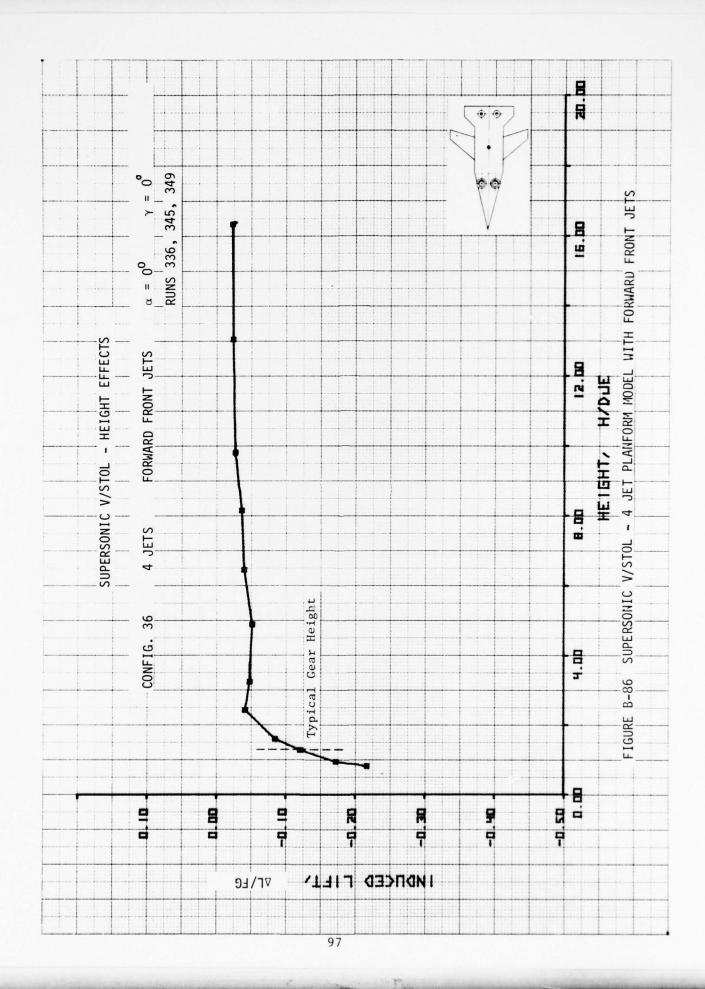


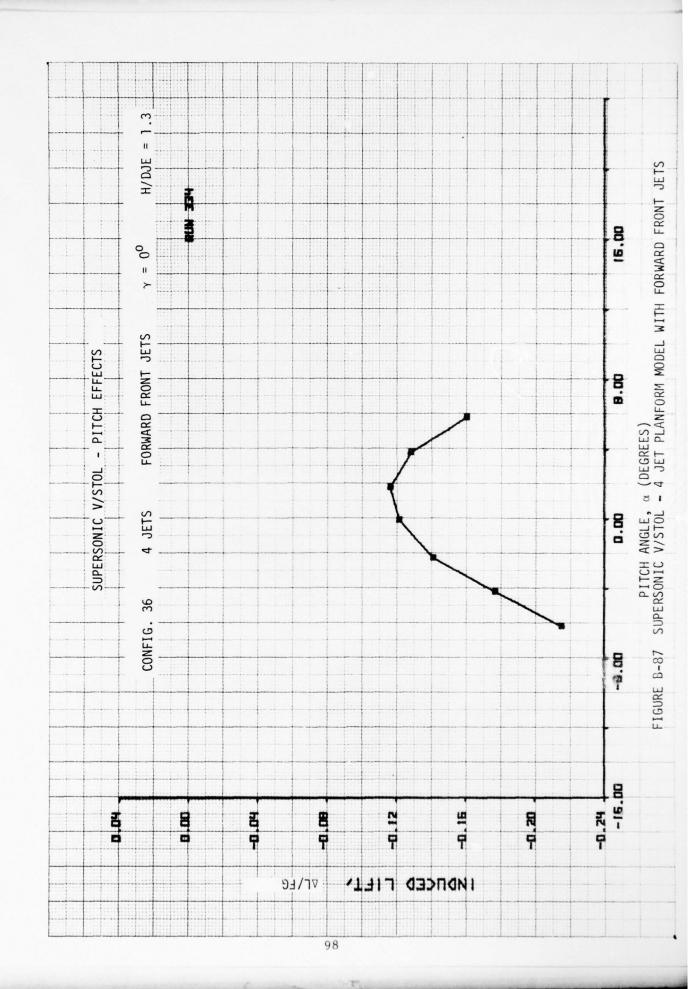


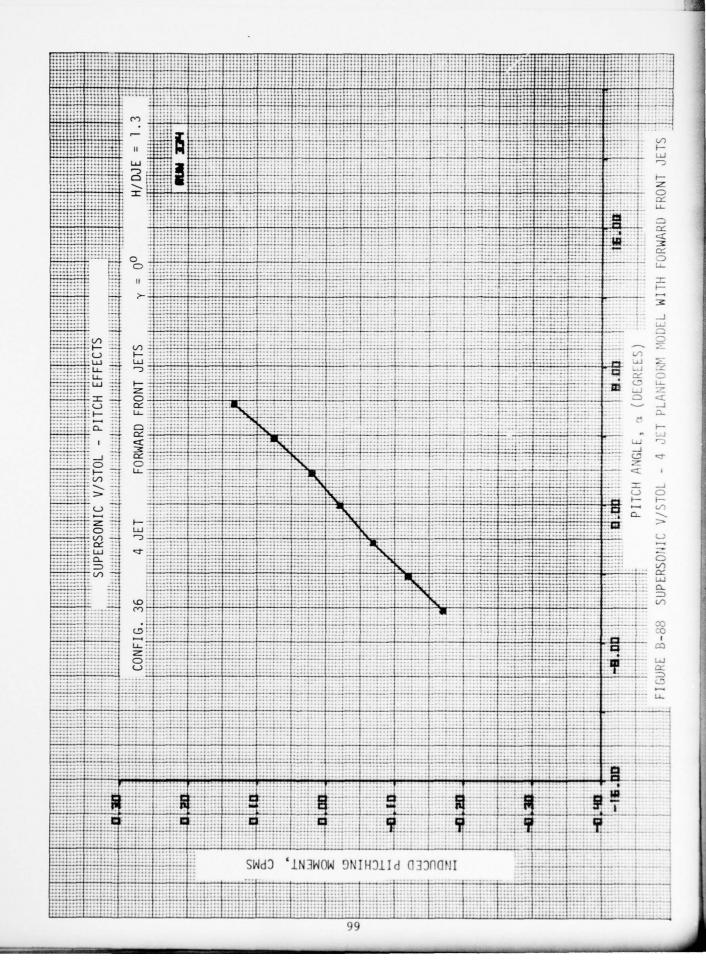


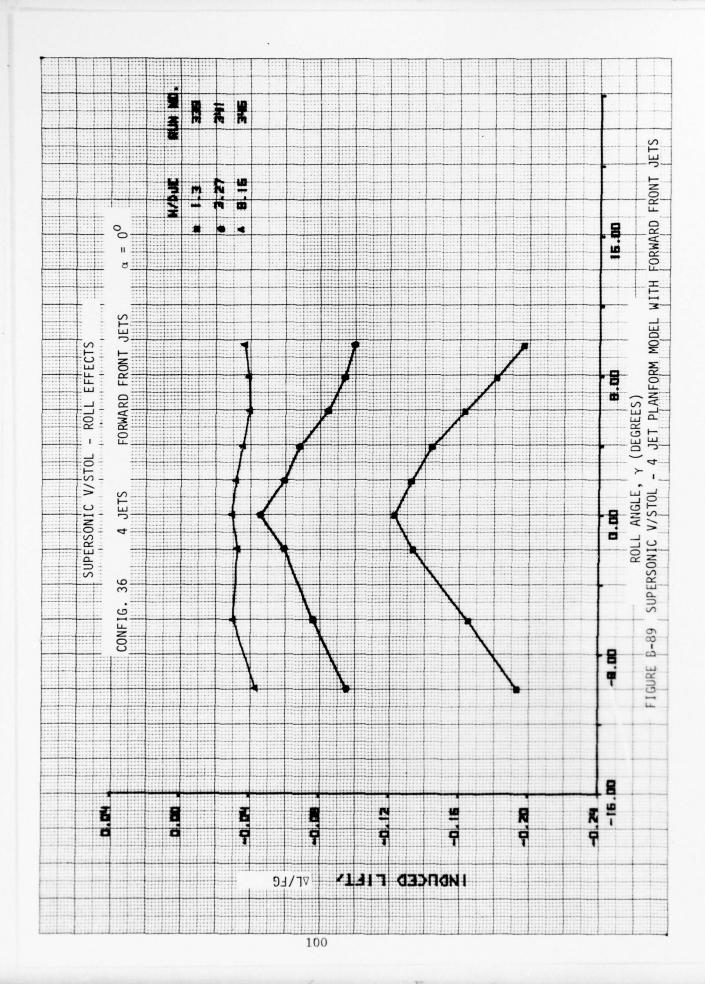


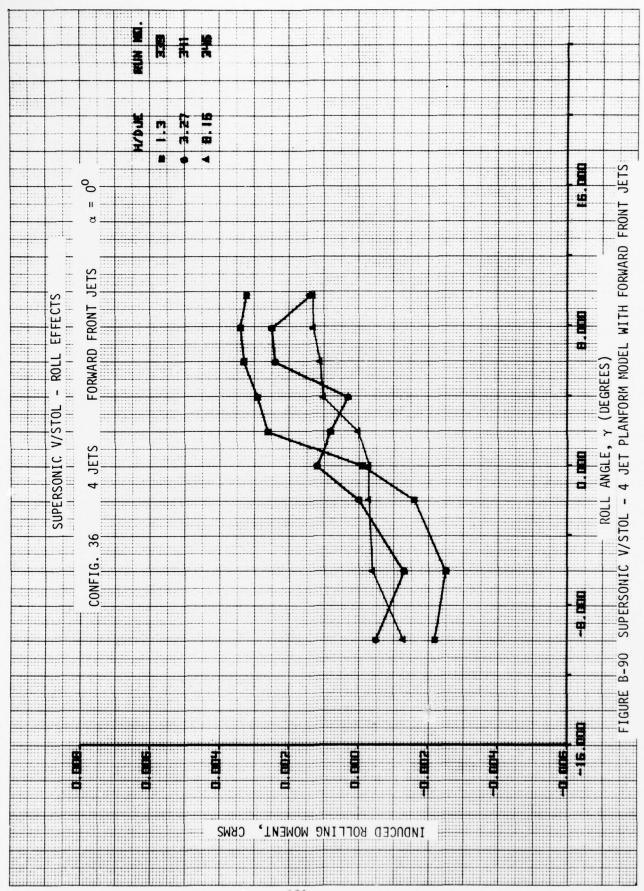


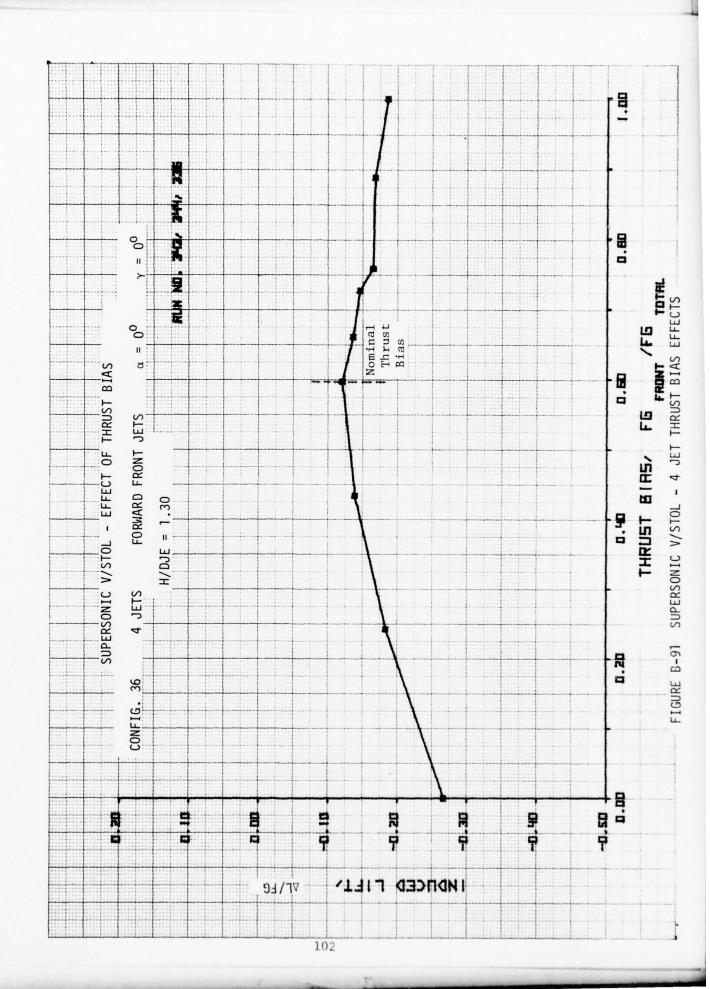


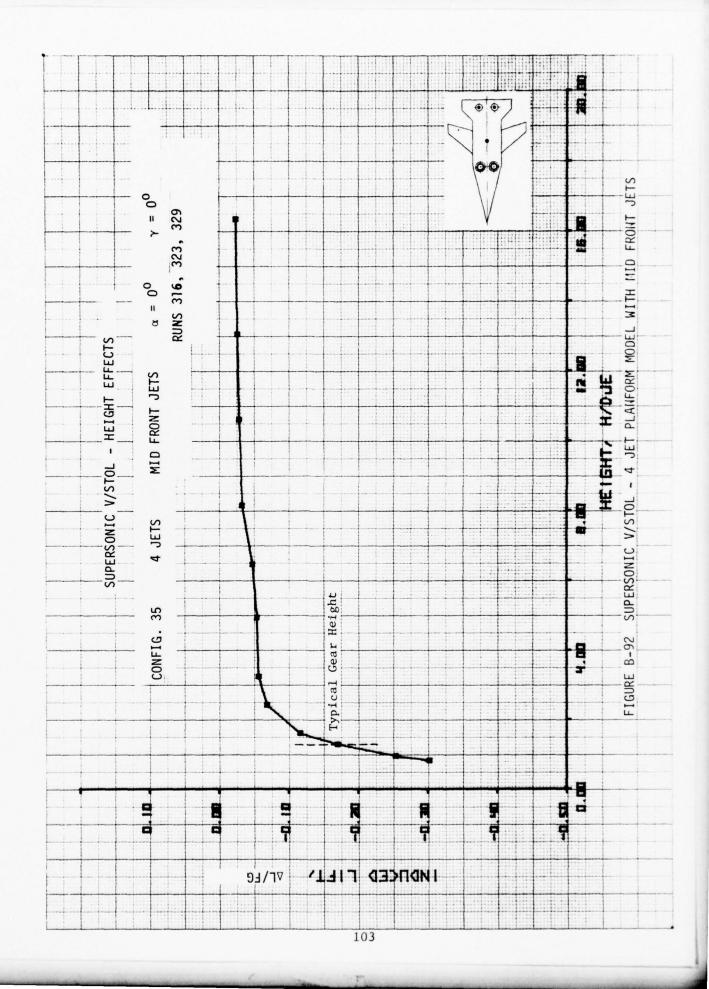


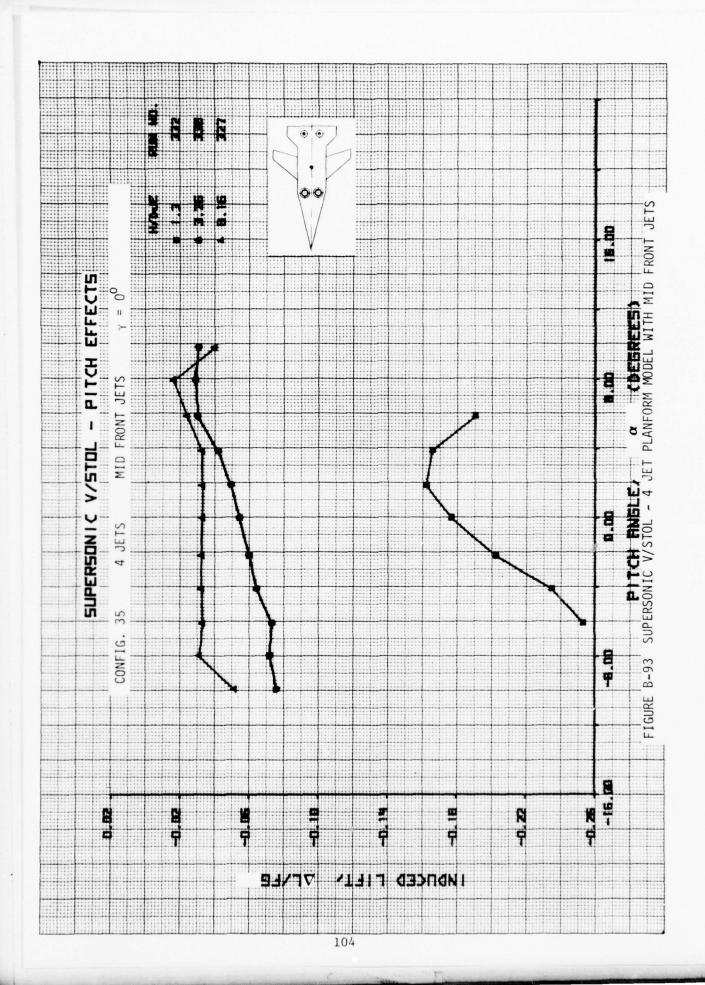


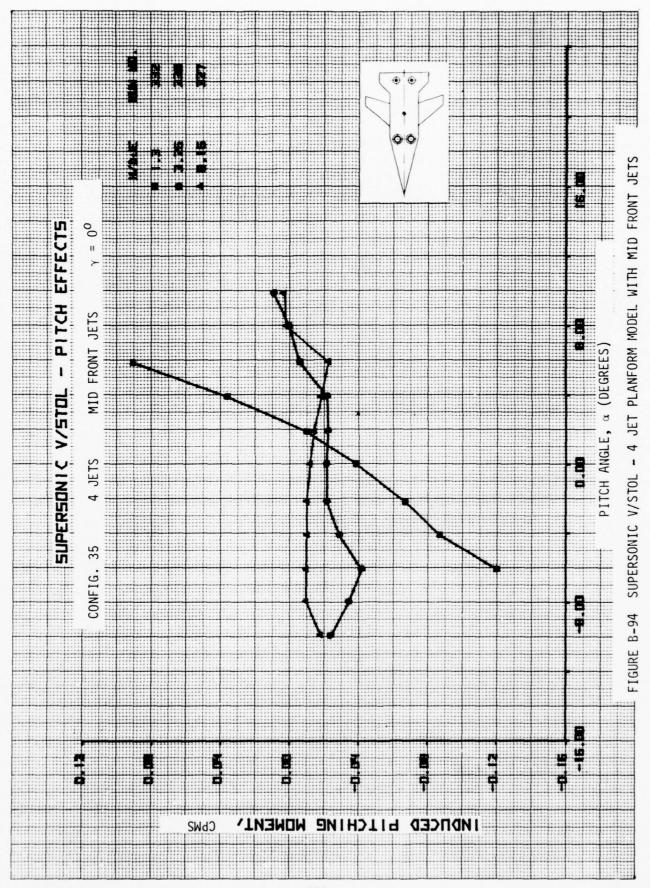


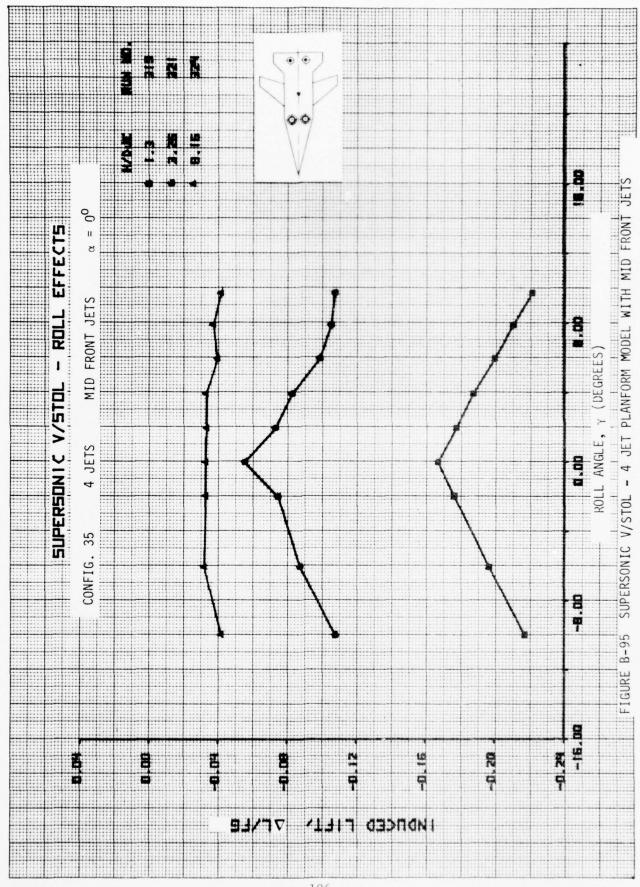


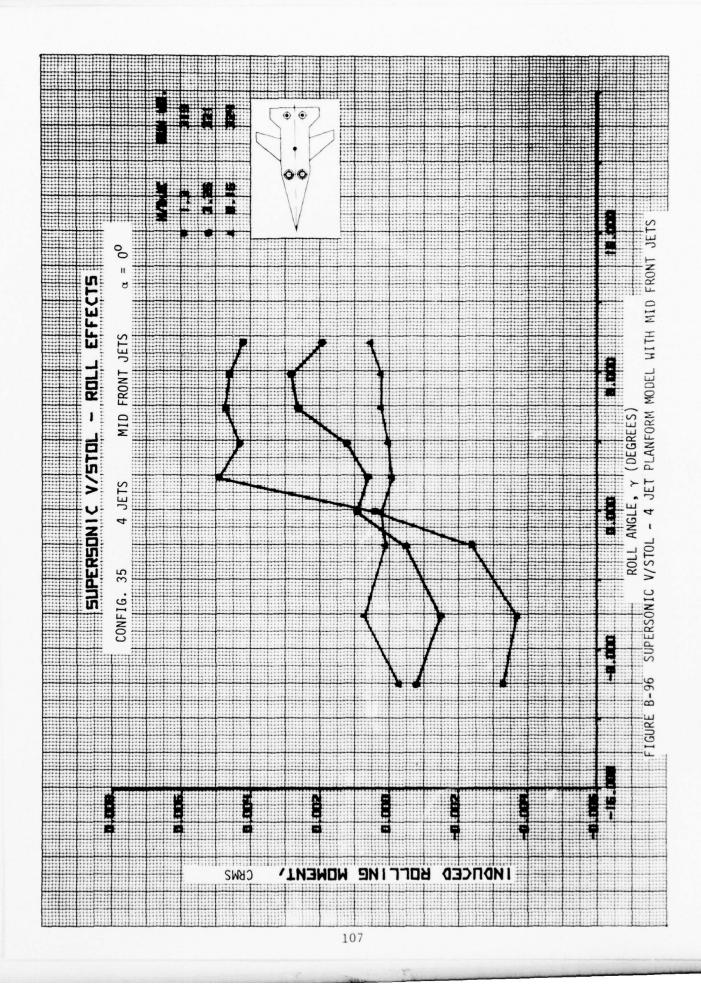


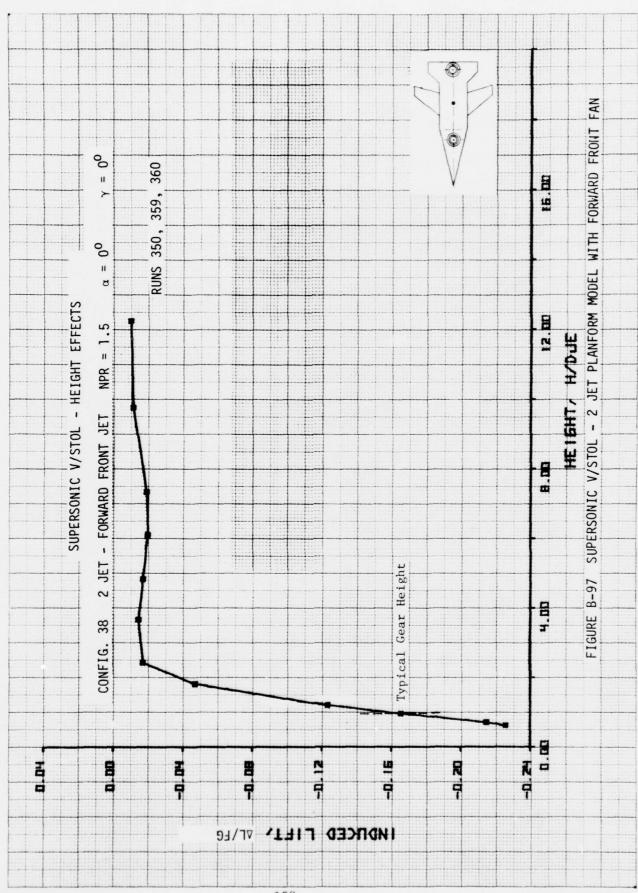


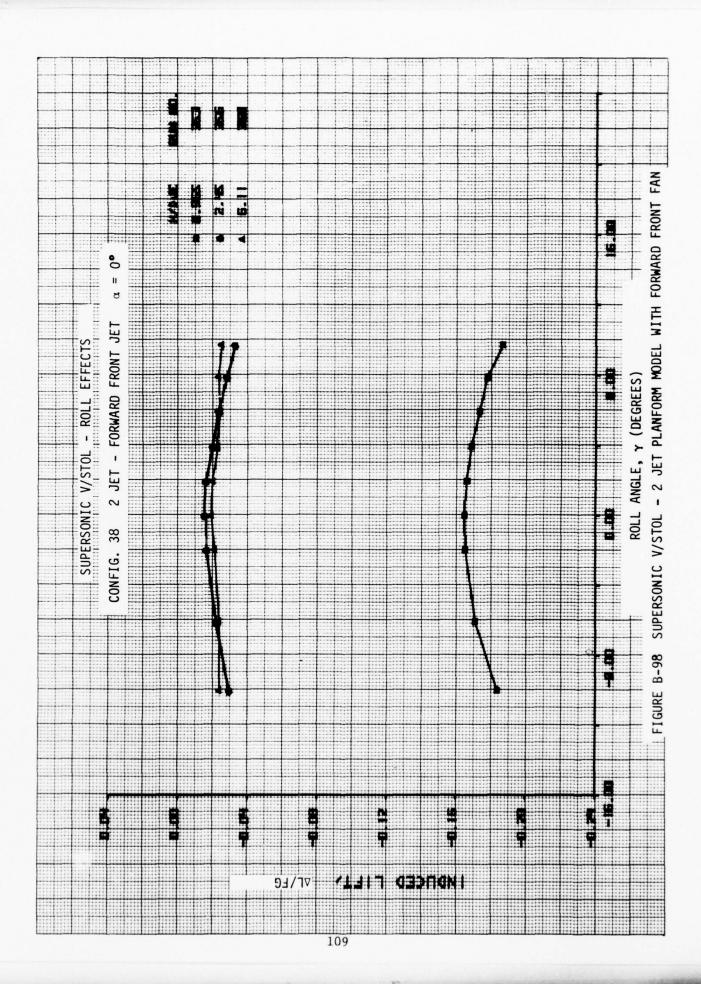


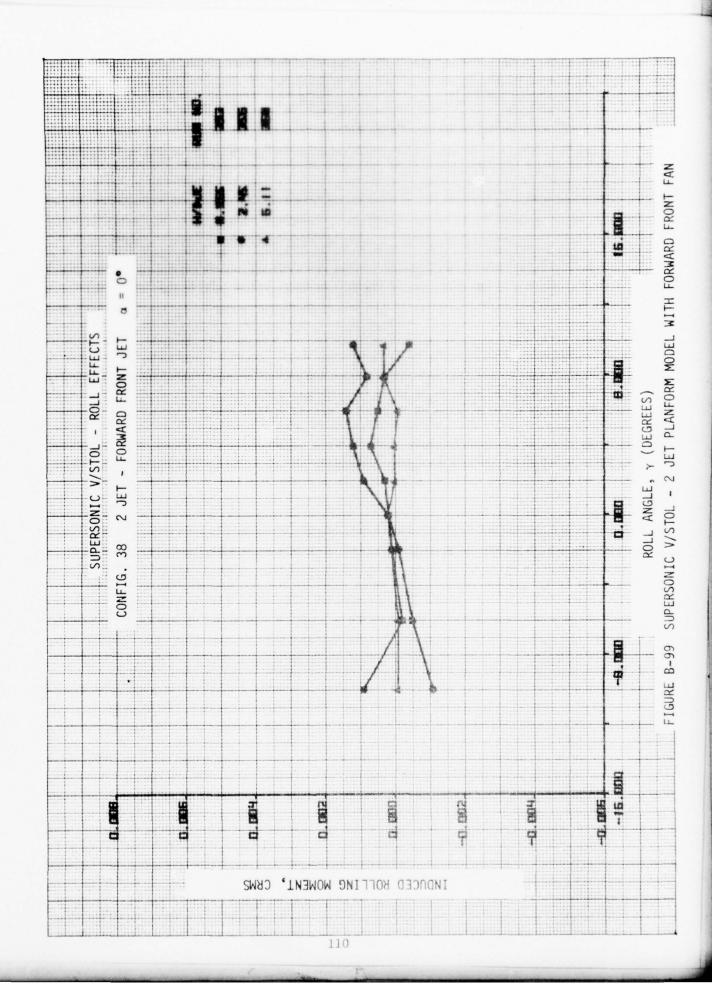


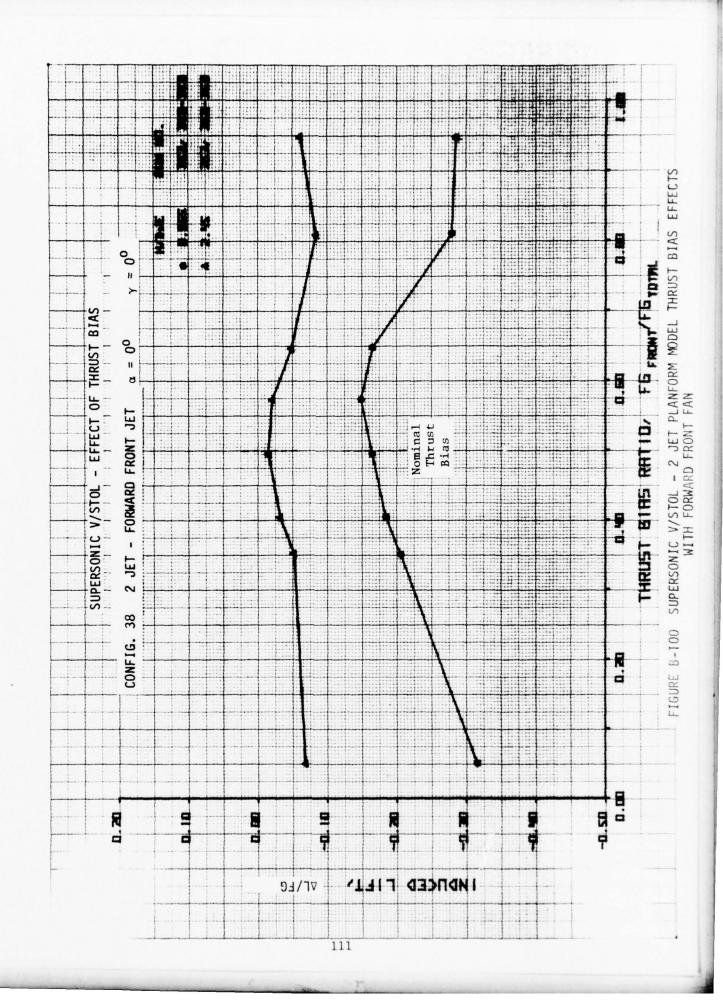


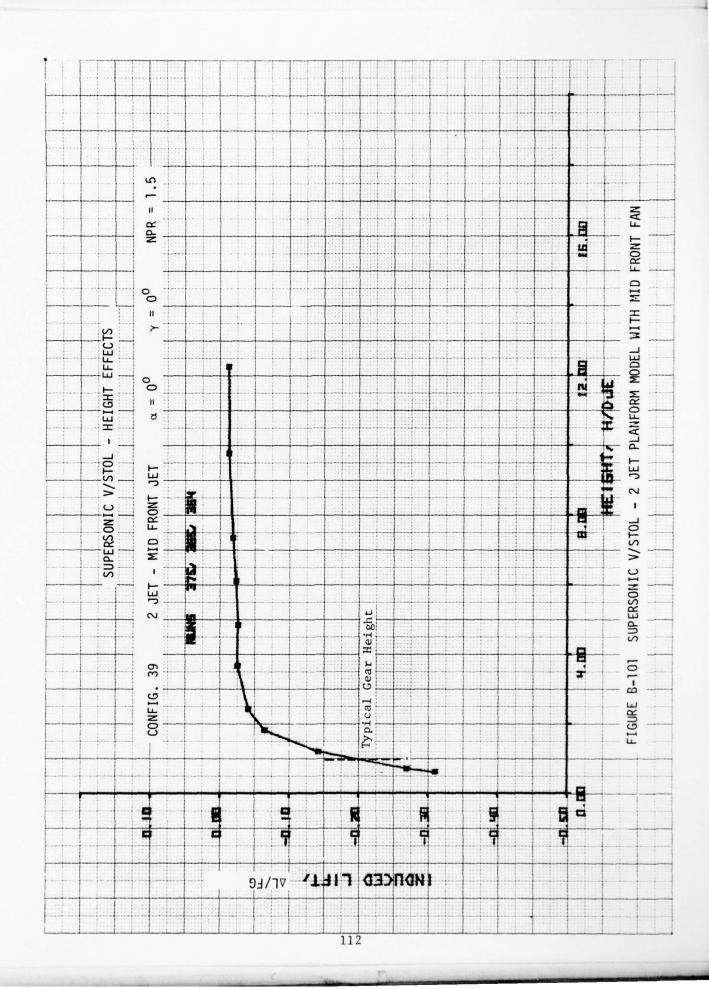


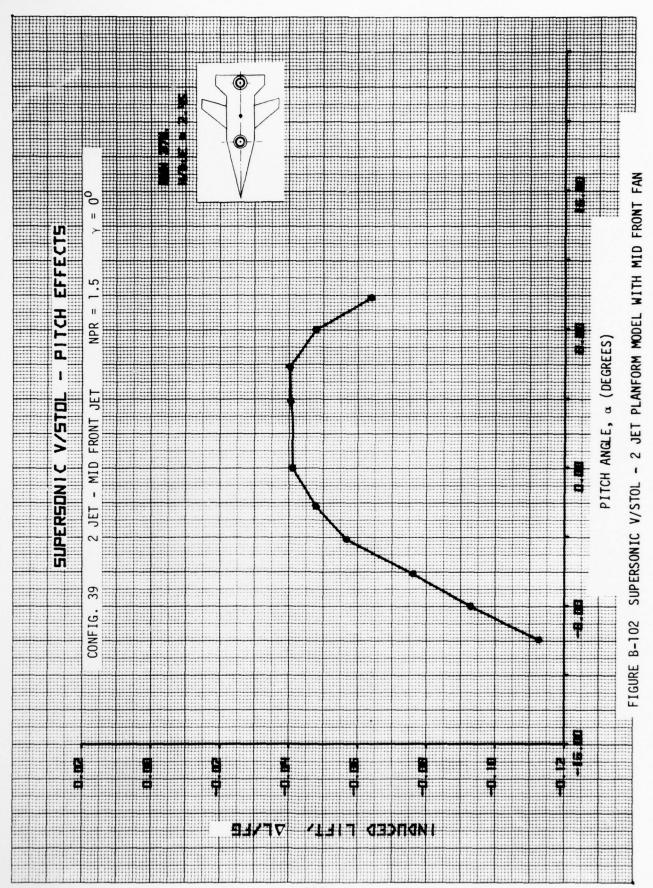


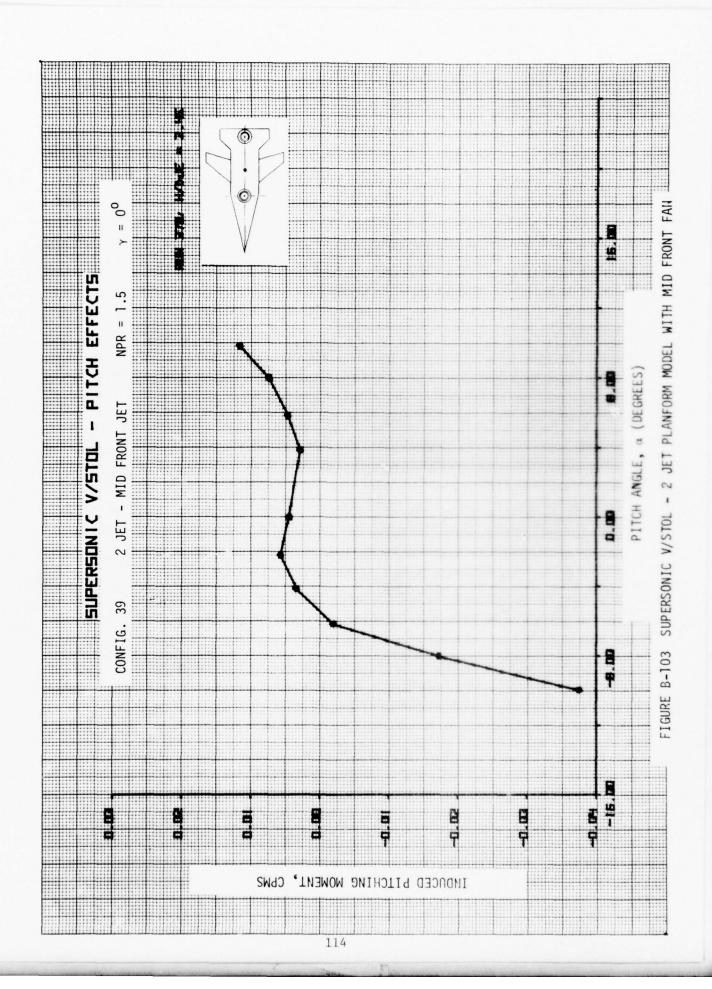


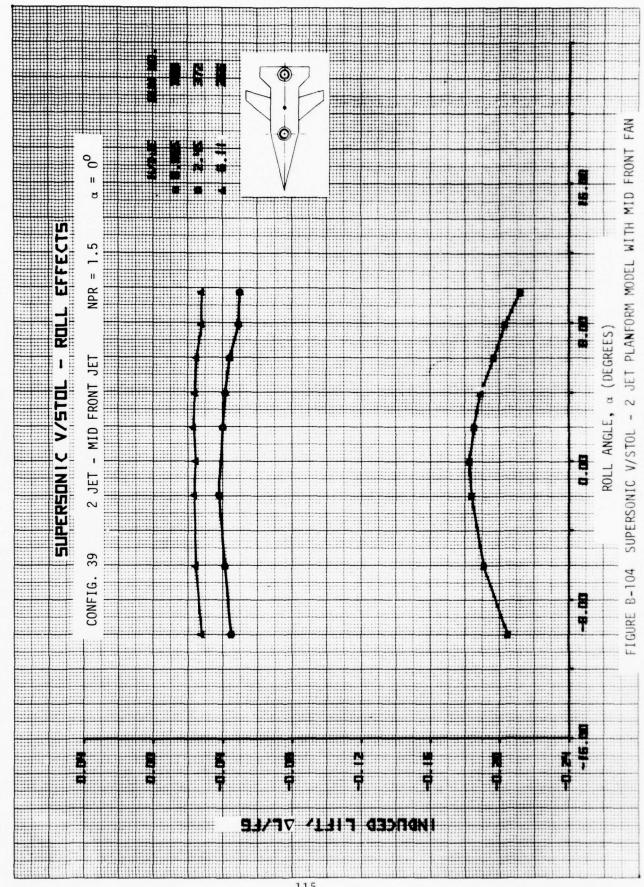


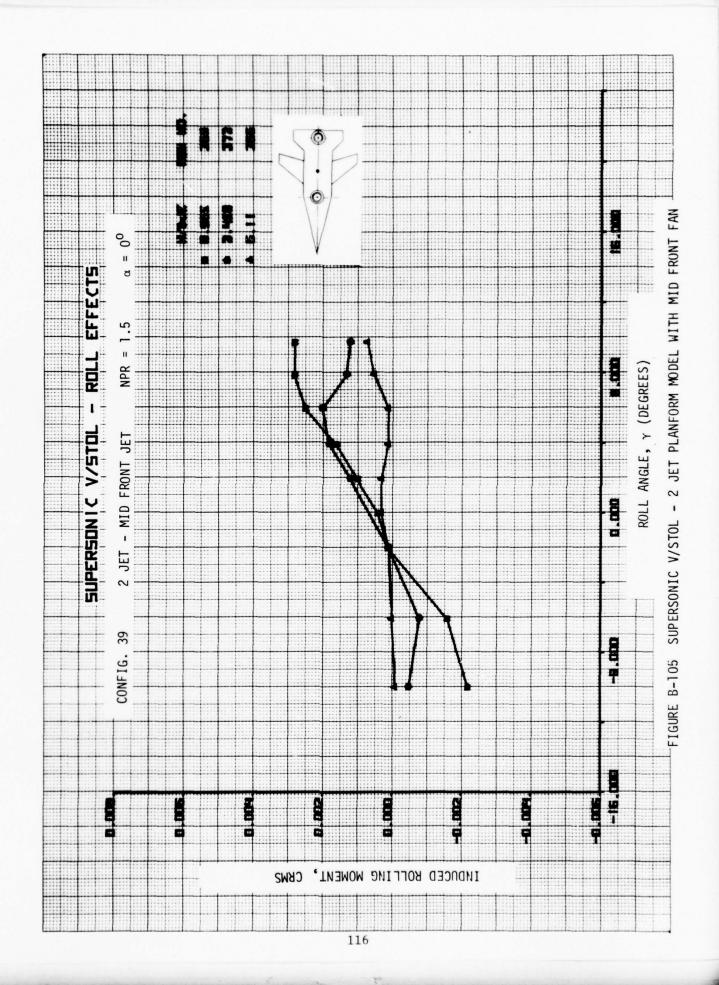


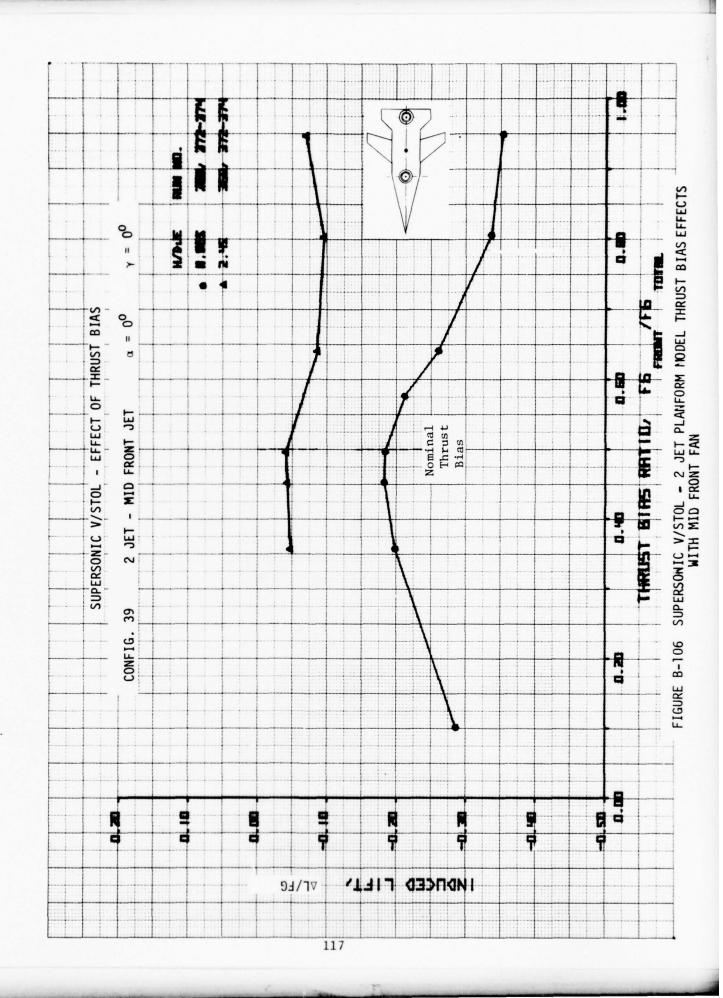


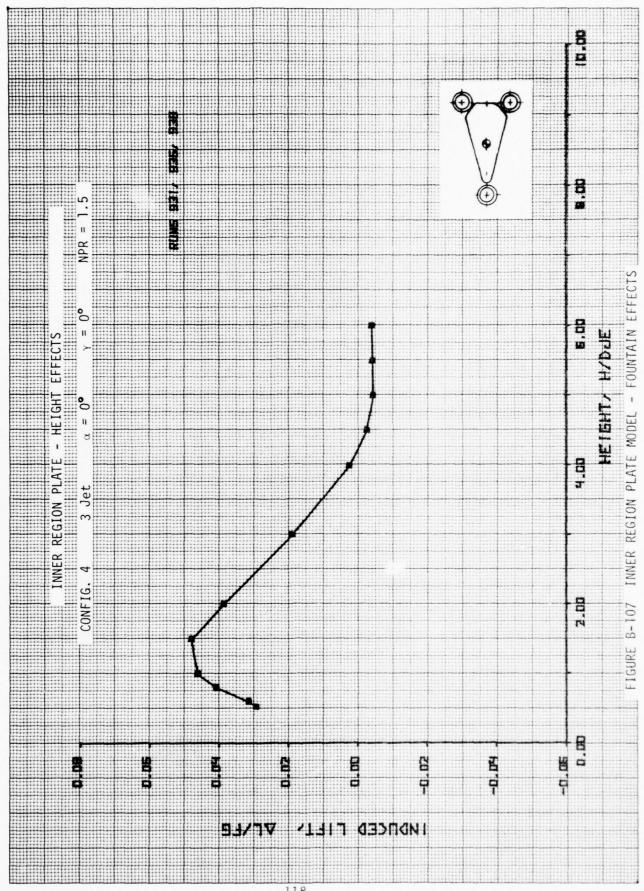


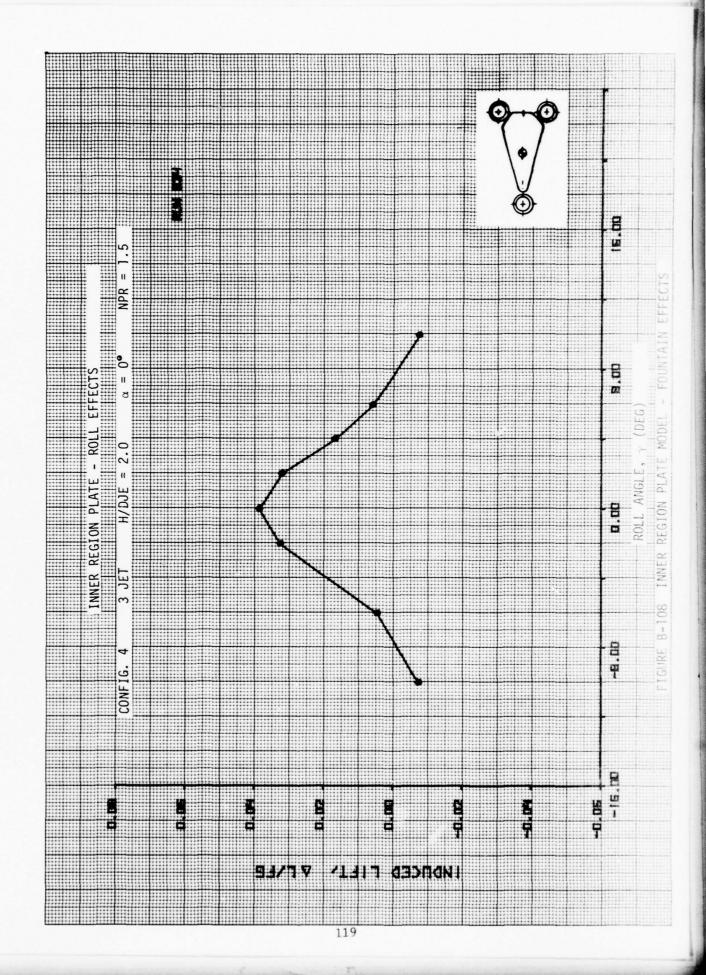


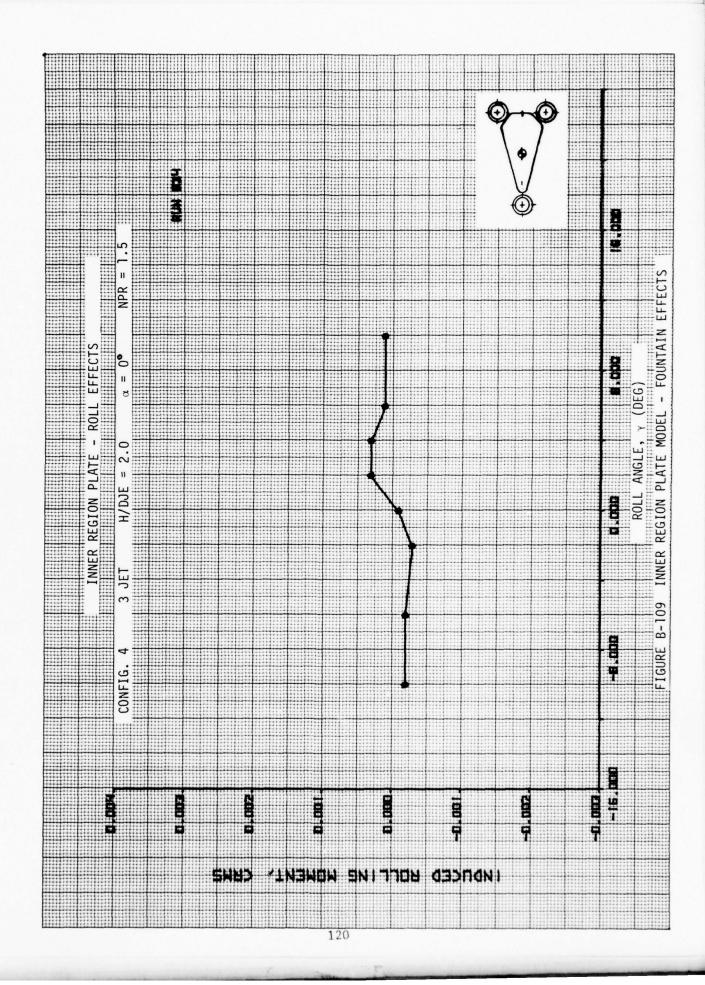












#### APPENDIX C

# INDUCED AERODYNAMIC DATA IN TIME AND FREQUENCY DOMAINS FOR DYNAMIC DECK MOTION CONDITIONS

The dynamic jet induced aerodynamic data obtained for a V/STOL aircraft model in proximity to a moving deck are presented in this Appendix. Specifically, induced lift, pitching moment, and rolling moment data are presented for heaving, pitching, and rolling deck motions at various heights, amplitudes, and frequencies. Additionally, induced axial force, side force, and yawing moment data are presented for selected aircraft Configurations 1 and 3.

The aerodynamic data are non-dimensionalized by the total thrust of the nozzles and are presented as time histories in the time domain (seconds-model scale), and as power spectral densities (PSD) in the frequency domain (Hz - model scale). Also cross power spectral densities (CSD) between the output aerodynamic response and the input deck motion are presented in the frequency domain. The PSD plots indicate the power and frequency content of the data. The CSD plots indicate the phase angle relationships between the output and input.

A summary of the dynamic data presentations arranged according to configuration variables is given in Table C-1. Generally, only the significant aerodynamic data are included which correspond to the generating deck motion. For example, induced lift and rolling moment data are presented for runs with deck rolling motion. For convenience in identifying the conditions for each run, a second summary is given in Table C-2 with the dynamic data runs in numerical sequence.

Within each run, the relevant data are presented in the following order.

CONFIGURATION OR TEST VARIABLE

TIME HISTORIES (Time Domain)

Induced Lift, CFNS
Induced Pitching Moment, CPMS
Induced Rolling Moment, CRMS
Induced Axial Force, CFAS
Induced Side Force, CFYS
Induced Yawing Moment, CYMS

Config. 1 and 3 for selected runs only

POWER SPECTRAL DENSITIES (Frequency Domain)

Induced Lift, CFNS

Induced Pitching Moment, CPMS

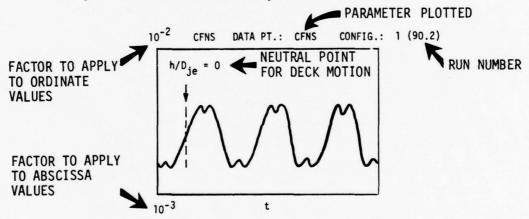
Induced Rolling Moment, CRMS

CROSS POWER SPECTRAL DENSITIES (Frequency Domain)

Output Aerodynamic Parameter to Input Deck Motion

The time history traces represent a 5 second interval taken at random during the 2 minute data acquisition period. To correlate the sinusoidal deck motions with the aerodynamic data, a vertical dashed line is marked on the time history plots as a reference. The reference line (labeled h/Dje = 0,  $\alpha$  = 0, or  $\gamma$  = 0) indicates that the deck is at the neutral point and is starting to go in the positive direction.

The parameter plotted, configuration number, and run number are indicated above the plot as shown in the example below:



These automatic data plots were obtained directly from the Hewlett Packard 5451B with which the data was digitized and statistically analyzed. The first complete set of data plots for Configuration 1, Figures C-1 through C-11, have more complete labeling to assist the user in interpreting the subsequent plots. The user should refer to Tables C-1 or C-2 for a description of the test conditions for any given test run and test point number.

TABLE C-1 DYNAMIC DATA PRESENTATION SUMMARY

RUN IO	CONFIG.	NPRF	NPRR	H/D je	h/D <sub>je</sub>	f <sub>h</sub> (Hz)	a(°)	f <sub>a</sub> (Hz)	γ(°)	f <sub>Y</sub> (Hz)	FIGURE No. C-		COMMENTS
	V CONTOU												
89.2	1	1.5	1.5	0.8	±0.3	2	0	0	0	0	1-3	Не	eave DJE=4.024 in
90.5,4.2		П		2	0.5,1,1.5						4-11,12-19,20-27		
384.2 *				1	1.5						28-30		
82.1,2,3	1	1.5	1.5	0.8	0	0	±2,6,10	2	0	0	31-37,38-44,45-51	Pt	tech
32.6,5,4				2		T					52-58,59-65,66-72		
35.1,2,3				5							73-76,77-80,81-84		
37.1,2,3				8			•				85-88,89-92,93-96		
92.1,2,3	1	1.5	1.5	0.8	0	0	0	0	±2,6,10	2	97-103,104-110, 111-117	Ro	211
163.1				2					±15	2	118-121		
		3-JET	CLEAN	- FREQU	ENCY EFFECT	'S							
89.1,2,3	1	1.5	1.5	0.8	0.3	1,2,3	0	0	0	0	122-124,1-3, 125-127	Не	eave
90.1,2,3		1	T	2	1.5	1,2,3					128~135,20-27, 136~143		
175.1,2,3		1.5	1.5	2	1.0	1+3	0	0	0	0	144~146,147-152 153~161		eq. Sweep in
163.1,2					0	0		•	±15	2,3	118~121,162-165	Ro	011
		3-JET (	LEAN -	COMBI	NED MOTIONS	EFFECTS						(°	)
167.2	1	1.5	1.5	2	0.5	2	±10	2	0	0	166~172	0	Heave, pitch in phase
170.2	T	T		T	1.0	П	±8	T			173-179	0	Heave, pitch in phase
170.3				+							180-186	90	Pitch lags heav
178.2				5			±10				187-193	0	Heave, pitch in phase
178.3				•	1.5			•	+	•	194-200	0	Heave, pitch in phase
169.2				2	0.5		0	0	±10	2	201-207	0	Heave, roll in phase
172.2,3				2	1.0	2,3				2,3	208-214,215-221	0	Heave, roll in phase
172.5,4						•				•	222-228,229-234	90	Roll lags heave
173.1						1				2	235-243	0	Heave, roll- double freq
173.2						1.5				3	244-252	0	Heave, roll- double freq
174.1,2,3						1+3				1+3	253-255, 256-263 264-272	0	Freq. sweep in 3,10,30 sec.
179.1				5	1.0	2				2	273-279	0	Heave, roll in phase
179.2				•	1.5			•		•	280-286	0	Heave, roll in phase
165.1,2				2	0	0	±10	2,3	±10	2,3	287-295,296-304	0	Pitch, roll in phase
166.2,3											305-313,314-322	90	Roll lags pitch

TABLE C-1 (Continued)
DYNAMIC DATA PRESENTATION SUMMARY

UN IO	CONFIG.	NPRF	NPRR	H/D <sub>je</sub>	h/D <sub>je</sub>	f <sub>h</sub> (Hz)	a(°)	f <sub>a</sub> (Hz)	γ(°)	f <sub>Y</sub> (Hz)	FIGURE No. C-	(*)	COMMENTS
68.2	l	1.5	1.5	2	0.5	2	+10	2	<u>+</u> 10	2	32 33 <b>1</b>	0	Heave, pitch, roll in phase
71.1,2					1.0	2,3	±8	2,3		2,3	332-340,341-349	0	n n n
171.4,3											350-358,359-367	90	Pitch & roll lag heave
180.1				5		2	±10	2		2	368-376	0	Heave, pitch, roll, in phase
180.2					1.5						377-385	0	
180.3											386-394	90	Roll lags heave & pitch
		JET (	LEAN -	SIMULA	TED VTOL EI	FECTS							
181.1,2,3	1	1.5	1.5	0.8.6.	2 0.3	2*	0	0	0	0	395-399,400-404, 405-409	*	VTOL rate = 0.1, 1,3, fps
182.1,2				2+5	1.0	+					410-414,415-419 420-424	t	VTOL rate = 0.06 0.6 ,1.7 fps
		2 JET	CLEAN		,								
117.1	1	1.0	1.5	2	1.5	Ž	0	0	0	0	425-426		Heave
108.1,2,3					0	0			±2,6,10	2	427-429,430-432, 433-435		Ro11
		3 JET	CLEAN	- NOZZLE	PRESSURE	RATIO EF	FECTS						
20.1,2,3	1	1.1	1.1	2	0.5,1,1.5	2	0	0	0	0	436-437,438-439. 440-441		Heave
127.1,2		•	•	5	1,1.5						442-443.444-445		
122.1		2.0	2.0	0.8	0.3						446-447		
123.1,2,3		T		2	0.5,1,1.5						448-449,450-451,	452-	453
128.1,2				5	1,1.5						454-455,456-457		
110.2,3,4				2	0				±2,6,10	2	458-461,462-465, 466-469		Roll
110.5	•	•	•						±10	3	470-473		
		3 JET (	CLEAN -	- LARGE	DECK EFFEC	rs				(1.	.83 m x 1.83 m Dec	k)	
66.1,2	1	1.5	1.5	0.8	0.5	1,2	0	0	0	0	474-476,477-479		Heave
64.1,2,4				2	0.5,1,1.5	2					480-482,483-485, 486-488		
64.3,5					1.5	1,3					489-491,492-494		
63.1,2,3				5	0.5,1,1.5	2			•		495-497,498-500 501-503		
68.1,2,3				2	0	0			±2,6,10	2	504-507,508-511, 512-515		Roll
68.4,5									10	1,3	516-519,520-523		Alter Prince
68.6,7,8				4					±2,6,10	2	524-527,528-531, 532-535		
67.1,2,3				5							536-539,540-543 544-547		
			WING P	ODS EFFE	CTS								
73.1	11	1.5	1.5	0.8	0.3	2	0	0	0	0	548-550		Heave
74.5,4,2		T		2	0.5,1,1.5	T	T	T			551-555,556-560, 561-565		

### TABLE C-1 (Continued)

RUN NO	CONFIG.	NP	RF	NPRR	H/D <sub>je</sub>	h/D <sub>je</sub>	f <sub>h</sub> (Hz)	a(°)	f <sub>a</sub> (Hz)	γ(•)	f <sub>γ</sub> (Hz)	FIGURE No. C-	COMMENTS
74.1,3	11	1.	5	1.5	2	1.5	1,3	0	0	0	0 .	566-570,571-575	Heave
75.2,1					5	1,1.5	2					576-578,579-581	
80.1,4,5					0.8	0	0	±2,6,10	2			582-585,586-589, 590-593	Pitch
80.2,3,6					2							594-597,598-601, 602-605	
94.2,3,4					0.8			0	0	±2,6,10	2	606-610,611-615, 616-620	Roll
96.2,4,3					2							621-625,626-630, 631-635	
		COL	PLEX	NOZZ	ZLE EFFE	ECTS							
139.2	12		1.5	1.5	0.8	0.3	2	0	0	0	0	636-637	Heave
140.2,3,4					2	0.5,1,1.	5					638-641,642-645, 646-649	
136.2,3					5	1,1.5				•	•	650-651,652-653	
143.2,3,4					2	0	0			±2,6,10	2	654-656,657-659, 660-662	Roll
		LI	FT IN	IP ROV	EMENT DI	EVICES EFF	ECTS						
132.2	13		1.5	1.5	0.8	0.3	2	0	0	0	0	663-664	Heave
133.1,2,3					2	0.5,1,1.	5					665-666,667-668, 669-670	
129.1,2		П			5	1,1.5					•	671,672,673,674	
112.2,3,4					0.8	0	0			±2,6,10	2	675-677,678-680, 681-683	- Roll
114.2,3,4					2							684-686,687-689, 690-692	
	SEMI-CO	NTOU	RED I	MODEL							1		
151.1	14	1	5 1	1.5	0.8	0.3	2	0	0	0	0	693-694	Heave
152.1,2.3					2	0.5,1,1.5						695-696,697-698, 699-700	
157.12			1		5	1,1.5						701-702,703-704	
154.1		+	+	-	0.8	0	0	±10	2			705-707	Pitch
156.1,2	-	+	+	-	2	-	+-	$\vdash$	2,3	$\vdash$	-	708-710, 711-713 714	
			+	-	5		-		-	- 10		715-717	Ro11
159.1					0.0			- 0					KOLL
159.1 145.1		+	+	-	0.8		+	0	0	±10	2		
159.1 145.1 147.1,2,3		_	+		0.8 2			0	0	±2,6,10	•	718-721,722-725, 726-729	
159.1 145.1 147.1,2,3			#		2			0	0		3	718-721,722-725, 726-729 730-733	
159.1 145.1 147.1,2,3 147.4 149.1 PLANE	FORM 2-D				-			0	0	±2,6,10	•	718-721,722-725, 726-729	
159.1 145.1 147.1,2,3 147.4 149.1 PLANE		G EF	FECTS	5	2	0.3	2	0	0	±2,6,10	3	718-721,722-725, 726-729 730-733	Heave
159.1 145.1 147.1,2,3 147.4 149.1 PLANE	FORM 2-D LOW WIN	G EF	FECTS		5	0.3	+ -			±2,6,10 ±10	3 2	718-721,722-725, 726-729 730-733 734-736	Heave
159.1 145.1 147.1,2,3 147.4 149.1 PLANF 193.2 194.2,3,4	FORM 2-D LOW WIN	G EF	FECTS		5		+ -			±2,6,10 ±10	3 2	718-721,722-725, 726-729 730-733 734-736 737-739 740-742,743-745,	Heave
159.1 145.1 147.1,2,3 147.4 149.1 PLANE 193.2 194.2,3,4	FORM 2-D LOW WIN	G EF	FECTS		5	0.5,1,1.5	+ -			±2,6,10 ±10	3 2	718-721,722-725, 726-729 730-733 734-736 737-739 740-742,743-745, 746-748	Heave Pitch
159.1 145.1 147.1,2,3 147.4 149.1 PLANE	FORM 2-D LOW WIN	G EF	FECTS		5	1,1.5		0	0	±2,6,10 ±10	3 2	718-721,722-725, 726-729 730-733 734-736 737-739 740-742,743-745, 746-748 749-751,752-754	
159.1 145.1 147.1,2,3 147.4 149.1 PLANE 193.2 194.2,3,4 201.2,3 196.2 198.2,3	FORM 2-D LOW WIN	G EF	FECTS		2 5 0.8 2 5 0.8	1,1.5		0	0	±2,6,10 ±10	3 2	718-721,722-725, 726-729 730-733 734-736 737-739 740-742,743-745, 746-748 749-751,752-754 755-759	
159.1 145.1 147.1,2,3 147.4 149.1 PLANF 193.2 194.2,3,4 201.2,3	FORM 2-D LOW WIN	G EF	FECTS		2 5 0.8 2 5 0.8 2	1,1.5		0	2 2,3	±2,6,10 ±10	3 2	718-721,722-725, 726-729 730-733 734-736 737-739 740-742,743-745, 746-748 749-751,752-754 755-759 760,761	

TABLE C-1 (Continued)

	CONFIG NO.	G. NI	PRF	NPRE	11/1	) je	h/Dje	f <sub>h</sub> (Hz)	a(°)	fa(Hz)	γ(°)	f <sub>y</sub> (Hz)	FIGURE No. C-	COMMENTS
186.3	2	1.	5	1.5	2		0	0	0	0	±10	3	777-781	Rol1
189.2						5					±10	2	782-785	
	2-D L	OW WIN	IG -	COMB	INED	MOT	IONS EFFECT	'S						
187.1	2		1.5	1.5		2	1.0	2	0	0	±10	2	786 -792   \$\phi = 0^\circ\$	Heave, roll
187.2								3				3	793-799 ¢ = 0°	Heave, roll
187.3				1				3		•		3	800-806 ¢ = 90	Roll lags heave
	MID W	ING EI	FECT	rs										
214.2	22		1.5	1.5	0	.8	0.3	2	0	0	0	0	807-809	Heave
	HIGH W	ING E	FFEC	CTS										
203.2	21		1.5	1.5	0	.8	0.3	2	0	0	0	0	810-812	Heave
204.2,3,4						2	0.5,1,1.5						813-815,816-818 819-821	
206.2,3						5	1,1.5				•		822-824,825-827	
210.2					0	. 8	0	0			±10	2	828-831	Rol1
212.2,3						2						2,3	832-835,836-839	
208.2						5						2	840-843	
		3 .	JET I	INNER	REGI	ON 1	PLATE							
932.2	4		1.5	1.5	0	.8	0.3	2	0	0	0	0	844-845	Heave DJE=4.024
933.2,3						2	1,1.5						846-847,848-849	
939.1,2						5		1					850-851,852-853	
00: 0		_	1											
935.2 2. SUPERSO						2	0	0			±10	2	854-857	Roll
	NIC V/ SEMI-	CONTOL 3	JET C	MODE CLEAN	1_		0.5	2	0	0	±10	2	854-857 858-860	Heave
2. <u>SUPERSO</u>	SEMI-	CONTOL 3	JET C	CLEAN		3			0	0				Heave DJE ≈ 2.462 in
2. <u>SUPERSO</u> 227.2	SEMI-	CONTOL 3	JET C	CLEAN	IL 1.	3	0.5		0	0			858-860 861-866,867-872	Heave DJE ≈ 2.462 in
227.2 228.2,3,4 235.2 *	SEMI-	CONTOL 3	JET C	CLEAN	IL 1.	3	0.5 0.8,1.6, 2.5		0	0			858-860 861-866,867-872 873-878	Heave DJE = 2.462 in
2. SUPERSO 227.2 228.2,3,4 235.2 * 238.2,3,4	SEMI-	CONTOL 3	JET C	CLEAN	1. 3.	3 3 2 2	0.5 0.8,1.6, 2.5 1.6 0.8,1.6,		0	0			858-860 861-866,867-872 873-878 879-881 882-884,885-887	Heave DJE = 2.462 in
2. SUPERSO	SEMI-	CONTOL 3	JET C	CLEAN	1. 3. 8.	3 3 2 1 1	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5		0 26	0			858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890	Heave DJE = 2.462 in
227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3	SEMI-	CONTOL 3	JET C	CLEAN	3. 8.	3 3 2 2 1 1 3 3	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2					858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896	Heave DJE = 2.462 in
2. SUPERSO 227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3 269.3	SEMI-	CONTOL 3	JET C	CLEAN	1. 3. 8. 13. 1.	3 3 2 1 3 3 3	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6				858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899	Heave DJE = 2.462 in
227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3 269.3 271.3	SEMI-	CONTOL 3	JET C	CLEAN	1. 3. 8. 13. 1. 3.	3 3 2 1 1 3 3 3 2	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6				858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899 900-902	Heave DJE = 2.462 in
2. SUPERSO 227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3 269.3 271.3 273.2	SEMI-	CONTOL 3	JET C	CLEAN	1. 3. 8. 13. 1. 3.	3 3 2 1 1	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6				858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899 900-902 903-902	Heave DJE = 2.462 in
227.2 228.2,3,4 235.2 * 238.2,3,4	SEMI-	CONTOL 3	JET C	CLEAN	1. 3. 8. 13. 1. 3. 8. 13.	3 3 2 1 3 3 2 1 3	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6 ±10	2	0	0	858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899 900-902 903-902 906-908	Heave DJE = 2.462 in
2. SUPERSO 227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3 269.3 271.3 273.2 278.2 230.3	SEMI-	CONTOL 3	JET C	CLEAN	8. 13. 1. 3. 1.	3 3 2 1 1 3 3 3	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6 ±10	2	0	0	858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899 900-902 903-902 906-908 909-912	Heave DJE = 2.462 in
2. SUPERSO 227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3 269.3 271.3 273.2 278.2 230.3 234.2	SEMI-	CONTOL 3	JET C	CLEAN	1. 3. 13. 1. 3. 8. 13. 1.	3 3 2 1 3 3 3 2 2	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6 ±10	2	0	0	858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899 900-902 903-902 906-908 909-912 913-916	Heave DJE = 2.462 in
2. SUPERSO 227.2 228.2,3,4 235.2 * 238.2,3,4 244.2,3 269.3 271.3 273.2 278.2 230.3 234.2	3 3	1	.5	4.4	1. 3. 8. 13. 1. 3. 8. 13. 8.	3 3 2 1 3 3 3 2 2	0.5 0.8,1.6, 2.5 1.6 0.8,1.6, 2.5 1.6,2.5	2	±6 ±10	2	0	0	858-860 861-866,867-872 873-878 879-881 882-884,885-887 888-890 891,893,894-896 897-899 900-902 903-902 906-908 909-912 913-916 917-920	Heave DJE = 2.462 in

## TABLE C-1 (Continued)

					YNAMI		FRES	ENIA	TON	JULIE		
RUN NO	CONFIG.	NPRF	NPRR	H/D je	h/D je	f <sub>h</sub> (Hz)	a(°)	f <sub>a</sub> (Hz)	γ(°)	f <sub>Y</sub> (H <sub>2</sub> )	FIGURE No. C-	COMMENTS
269.2,3,4	3	1.5	4.4	1.3	0	0	±6	1,2,3	0	0	931-933,897-899, 934-936	Pitch
271.2,3,4				3,3			±10				937-939,900-902, 940-942	
230.2,3				1.3			0	0	±10	1,2	943-946,909-912	Roll
234.1,2,3				3.3				-		1,2,3	947-950 913-916,951-954	
		3 JET	- COME	SINED MOT	IONS EFFE	CTS						
232.2	3	1.5	4.4	1.3	0.5	2	0	0	±10	2	955-961 ¢ = 0°	Heave, roll
236.2,3		I		3.3	1.6				±10		962-967,6 = 0°, 968-973 ¢ = 90°.	Roll lags heave
		3 JET	- SIM	ULATED VT	OL EFFECT	rs						
279.2,3,4	3	1.5	4.4	2.179.3	0.5	2*	0	0	0	0	974-977,978-981, 982-985	*VTOL Rate = 0.
280.2,3,4				3.3‡8.2	1.6	*					986-989,990-993 994-997	ti ti
		3 JET	- NOZ	ZLE PRESS	URE RATIO	EFFECTS						
258.2	3	1.1	4.4	1.3	0.5	2	0	0	0	0	998-1000	Heave
259.2,3,4				3.3	0.8,1.6, 2.5						1001-1003,1004-1006 1007-1009	
252.1,2				8.2	1.6,2.5						1010-1012,1013-1015	
261.2		2.0	2.0	1.3	0.5						1016-1018	
262.2,3,4				3.3	0.8,1.6,						1019-1021,1022-1024 1025-1027	
254.1,2				8.2	1.6,2.5						1028-1030,1031-1033	
		1 JET	CLEAN	1								
248.2,3	3	1.5	1.0	3.3	1.6,2.5	2	0	0	0	0	1034-1036,1037-1039	Heave
250.2,3				8.2	1.6,2.5	1					1040-1042,1043-1045	
247.3				3.3	0	0			±10	2	1046-1049	Roll
		1 JET	- NOZZ	LE PRESSI	URE RATIO	EFFECTS						
264.2,3	3	2.0	1.0	3.3	1.6,2.5	2	0	0	0	0	1050-1052,1053-1055	Heave
274.2,3				8.2	1.6,2.5				1		1056-1057,1058-1059	
266.2				3.3	0	0			±10	2	1060-1063	Roll
PLANFO	ORM 2-D M 3-JET		LOW W	ING EFFE	CTS							
284.2	31		4.4	1.3	0.5	2	0	0	0	0	1064-1065	Heave DJE = 2.462 in.
285.2,3,4				3.3	0.8,1.6,						1066-1067,1068-1069 1070-1071	
285.1				3.3	1.6	1					1072	
301.2,3			1	8.2	1.6,2.5	2					1073-1074,1075-1076	
282.2				3.3	0	0	±10	2			1077-1079	Pitch
295.2			士	1.3			0	0	+10	2	1080-1082	
97.2				3.3							1083-1085	
00.2				8.2							1086-1088	
	1	LIFT I	MPROVEM	ENT DEVI	CES EFFEC	TS						
87.2	32	1.5	4.4	1.3								

### TABLE C-1 (Continued)

RUN NO	CONFIG.	NPRF	NPRR	H/D je	h/D <sub>je</sub>	f <sub>h</sub> (Hz)	a(.)	f <sub>a</sub> (Hz)	$\overline{}$	f <sub>y</sub> (Hz)	FIGURE	CONSCIPTS
288.2,3	32	1.5	4.4	3.3		2	0	0	0	0	No. C- 1091-1092,1093-1094	Heave
291.2	1	1.3	+	1.3	1.6,2.5	0	<u> </u>	1		2	1095-1097	Rol1
293.2	-	+	+	3.3	-i	-			±10		1099-1100	ROTT
	ET, MID	ITNC E	PERCIPC	3.3							1099-1100	
			_	1 2 2	0.016	2		0	-	0	1101-1102,1103-1104,	Heave
305.2,3,4	33	1.5	4.4	3.3	0.8,1.6,		0	0	0	0	1101-1102,1103-1104,	neave
		HIGH W	ING EF	FECTS								
307.2	34	1.5	4.4	1.3	0.5	2	0	0	0	0	1107-1108	Heave
308.2,3,4				3.3	0.8,1.6, 2.5						1109-1110,1111-1112, 1113-1114	
314.1,2				8.2	1.6,2.5					<b>—</b>	1115-1116,1117-1118	
309.2		$\prod$		1.3	0	0			±10	2	1119-1121	Roll
312.1				3.3						•	1122-1124	
4 JET	, FORWARD	FRONT	JETS									
337.1	36	1.5	4.4	1.3	0.5	2	0	0	0	0	1125-1127	Heave DJE = 2.462 in.
338.1,2,3				3.3	0.8,1.6, 2.5						1128-1130,1131-1133 1134-1136	
348.2,3				8.2	1.6,2.5						1137-1138,1139-1140	
335.2				1.3	0	0	±6	2		<b>•</b>	1141-1143	Pitch
340.2							0	0	±10	2	1144-1146	Roll
342.2				3.3							1147-1149	
347.2				8.2							1150-1152	
4 JET,	MID FRO	NT JET	s									
317.2	35	1.5	4.4	1.3	0.5	2	0	0	0	0	1153-1154	Heave
318.2,3,4				3.3	0.8,1.6,						1155-1157,1158-1160, 1161-1163	
18.5				1	2.5	3					1164-1166	
26.2,3				8.2	1.6,2.5	2					1167-1168,1169-1170	
33.2				1.3	0	0	±6	2			1171-1173	Pitch
31.2				3.3			±10				1174-1176	
28.2				8.2				•	•		1177-1179	
20.2				1.3			0	0	±10	2	1180-1182	Roll
22.2,3				3.3						2,3	1183-1186,1187-1190	
25.2				8.2						2	1191-1193	
2 JET,	FORWARD	FRONT	JET									
51.2	38	1.5	1.5	1.0	0.4	2	0	0	0	0	1194-1195	Heave DJE = 3.285 i
52.2,3,4				2.5	0.6,1.2,						1196-1197,1198-1199, 1200-1201	
62.2,3				6.1	1.2,1.8						1202-1203,1204-1205	
54.2				1.0	0	0			±10	2	1206-1208	Roll
55.1				2.5							1209-1211	
61.2				6.1							1212-1214	

TABLE C-1 (Conclued)

RUN NO	CONFIG. NO.	NPRF	NPRR	H/Dje	h/D <sub>je</sub>	f <sub>h</sub> (Hz)	a(°)	f <sub>a</sub> (Hz)	γ(•)	f <sub>Y</sub> (Hz)	FIGURE No. C-	COMMENTS
2-JET	MID FROM	T JET										
376.3	39	1.5	1.5	1.0	0.4	2	0	0	0	0	1215-1216	Heave DJE = 3.285 in.
377.1,2,3				2.5	0.6,1.2,						1217-1219, 1220-1222 1223-1225	
377.4				1	1.8	3					1226-1228	
368.2,3				6.1	1.2,1.8	2					1229-1230, 1231-1232	
379.2				2.5	0	0	±10	2			1233	Pitch
370.2				1.0			0	0	±10	2	1234-1236	Roll
371.1,2				2.5						2,3	1237-1239, 1240-1242	
367.2				6.1						2	1243-1245	

TABLE C-2
DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Cont		NPF	RF	NPF	W	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	f a	(Hz)	Y(*)	T	f <sub>y</sub> (Hz)	FIGURE NO. C-	COMMENTS
63.1	1		1.	5	1.	5	5	0.5	2	0		0	0		0	495-497	Large Ground Plane: Runs 63-68
.2			1					1.0		1	1	1			1	498-500	
.3				1				1.5								501-503	
64.1	П			T			2	0.5			T			+	1	480-482	
.2								1.0								483-485	
.3	П							1.5	1							489-491	
.4									2							486-488	
.5									3							492-494	
66.1							0.8	0.5	1					1	1	474-476	
.2							1	1	2		1					477-479	
67.1							5	0	0		T		±2	T	2	536-539	
.2							1				1		±6		1	540-543	
.3													±10			544-547	
68.1							2						<b>±</b> 2	T		504-507	
.2							1						±6			508-511	
.3													±10		+	512-515	
.4											1				1	516-519	
.5				П									1		3	520-523	
.6				П			4						<u>+2</u>		2	524-527	
.7													±6			528-531	
.8					-								±10		į.	532-535	
73.1	1	1	1.	5	1.5	5	0.8	0.3	2				0	T	0	<b>548-</b> 550	Small Ground Plane
74.1							2	1.5	1					I		566-570	
74.2									2					T		561-565	
.3				-					3					1		571-575	
.4				-				1.0	2					1		556-560	
.5							1	0.5								551-555	
75.1							5	1.5								579-581	
.2							1	1.0								576-578	
80.1							0.8	0	0	±2		2				582-585	
.2							2			1						594-597	
.3							+			±6				1		598-601	
.4							0.8			+						586-589	
.5										±10						590-593	
.6				1	_		2							1		602-605	
82.1	1						0.8			±2						31-37	
.2										±6		1				38-44	
				1						±10						45-51	

TABLE C-2 (Continued)

DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Contig.	NPRF	NPRA	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	(h(Hz)	a(*)	f <sub>3</sub> (liz)	Y(*)	f <sub>Y</sub> (Hz)	FIGURE NO. C-	COMMENTS
82.4	1	1.5	1.5	2	0	0	<u>+</u> 10	2	0	0	66-72	
.5	1	1	1	1		1	±6		1		59-65	
.6							±2				52-58	
85.1		$H^-$	Η-	5			±2				73-76	
.2							<u>+</u> 6				77-80	
.3							±10				81-84	
87.1				8			±2				85-88	
.2							±6				89-92	
.3							±10				93-96	
89.1			П	0.8	0.3	1.	0	0			122-124	
.2				11		2					1-3	
.3				1		3					125-127	
90.1		П		2	1.5	1					128-135	
.2				11		2					20-27	
.3						3					136-143	
.4					1.0	2					12-19	
.5					0.5	2					4-11	
92.1				0.8	0	0			±2	2	97-103	
.2									±6		104-110	
.3		1		1					±10		111-117	
94.2	11	1.5	1.5	0.8	0	0	0	0	±2	2	606-610	
.3	1	11	1	11	1		1		<u>+</u> 6	,	611-615	
.4									±10		616-620	
96.2		$\prod$		2					±2		621-625	
.3									±10		626-630	
.4									<u>+</u> 6		631-635	
108.1	1	1.0	1.5	2	0	0	0	0	±2	2	427-429	
.2		1	1	1	1	1	1	1	±6		430-432	
.3									±10		433-435	
110.2		2.0	2.0						±2		458-461	
110.3		1	1						±6		462-465	
.4									±10		466-469	
.5										3	470-473	
112.2	13	1.5	1.5	0.8	0	0	0	. 0	±2	2	675-677	
.3	1	1	1	1	1		1		±6		678-680	
.4									±10		681-683	

TABLE C-2 (Continued)
DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Config.	NERF	NPRA	H <sup>7D</sup> Kef	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	fa(Hz)	Y(*)	(Hz)	FIGURE NO. C-	COMMENTS
114.2	13	1.5	1.5	2	0	0	0	0	±2	2	684-686	
.3	1	1	1					1	±6		687-689	
.4									±10		690-692	
117.1	1	1.0	1.5	2	1.5	2	0	0	0	0	425-426	
120.1				2	0.5		$\vdash$	-1-	1	$\dot{\Box}$	436-437	
.2					1.0						438-439	
.3					1.5						440-441	
122.1		2.0	2.0	0.8	0.3	-	$H^-$		H	$H^{-}$	446-447	
123.1				2	0.5	$\vdash$	$\vdash$	<del></del>	H-	$H^{-}$	448-449	
.2					1.0						450-451	
.3					1.5						452-453	
127.1		1.1	1.1	5	1.0		$\vdash$		H-		442-443	
.2		+	1		1.5						444-445	
128.1		2.0	2.0	$H^{-}$	1.0						454-455	
.2		1	1		1.5						456-457	
129.1	13	1.5	1.5	5	1.0	2	0	0	0	0	671-672	
.2	1	1	1		1.5	1	1	1		1	673-674	
132.1				0.8	0.3						663-664	
133.1				2	0.5						665-666	
.2				1	1.0						667-668	
.3					1.5						<b>669-</b> 670	
136.2	12	1.5	1.5	5	1.0	2	0	0	0	0	650-651	
.3		$\sqcup$	$\Box$		1.5					Ц_	652-653	
139.2				0.8	0.3						636-637	
140.2				2	0.5						638-641	
.3					1.0						642-645	
.4				Ц_	1.5					1	646-649	
143.2					0	0			±2	2	654-656	
.3									±6		657-659	
.4	1		1		1	1	1		±10	1	660-662	
145.1	14	1.5	1.5	0.8	0	0	0	0	±10	2	715-717	
147.1				2					±2		718-721	
. 2									±6		722-725	
. 3									±10	'	726-729	
.4		Ш							-	3	730-733	
149.1		Щ		5		1			1	2	734-736	
151.1				0.8	0.3	2			0	0	693-694	

TABLE C-2 (Continued)
DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run	Con	fig.	NP	RF	NP	RA ]	H/D		h/D <sub>Re</sub>			f (Hz)	Y(*)	f (Nz)		FIGURE	
No.		ο.						Ref	Re	f h.m.	- /			γ	*( )	NO. C-	COMMENTS
152.1	1	4	1.5	•	1.	5	2	2	0.5	2	0	0	0	0	ī	695-696	
.2									1.0							697-698	
.3			Ц						1.5				$\Box$			699-700	
154.1			Ц				0.6	3	0	0	±10	2				705-707	
156.1							2									708-710	
.2			Ц				1					3				711-713	
157.1							5		1.0	2	0	0				701-702	
.2			Ц						1.5	11		<u> </u>				703-704	
159.1									0	0	±10	2				714	
163.1	1		1.	5	1.	5	2		0	0	0	0	±15	2		118-121	
.2														3		162-165	
165.1											±10	2	=10	2	0	287-295	Pitch, Roll in Phase
.2												3		3	0	296-304	Pitch, Roll in Phase
166.2												2		2	90	305-313	Roll Lags Pitch
.3												3		3	90	314-322	Roll Lags Pitch
167.2									0.5	2		2	0	0	0	166-172	Heave, Pitch in Phase
168.2											1		±10	2	0	323-331	Heave, Pitch, Roll in Phase
169.2											0	0			0	201-207	Heave, Roll in Phase
170.2									1.0		±8	2	0	0	0	173-179	Heave, Pitch in Phase
.3						Ц									90	180-186	Pitch Lags Heave
171.1										1			±10	2	0	332-340	Heave, Pitch, Roll in Phase
. 2										3		3	1	3	0	341-349	Heave, Pitch, Moll in Phase
.3										11				1	90	359-367	Pitch & Roll Lag Heave
.4										2		2		2	90	350-358	Pitch & Roll Lag Heave
172.2											0	0			0	208-214	Heave, Roll in Phase
.3										3				3	0	215-221	Heave, Roll in Phase
.4										11					90	229-234	Roll Lags Heave
.5										2				2	90	222-228	Roll Lags Heave
173.1										1				+	0	235-243	Heava, Roll-Double Freq.
.2										1.5				3	0	244-252	Heave, Roll-Double Freq.
174.1										1-3				1-3	0	253-255	Freq. Sweep in 3 Sec. Records 1,2 and 3
. 2										11					0	256-263	Freq. Sweep in 10 Sec. Records 1,2, and 3
.3															0	264-272	Freq. Sweep in 30 Sec. Records 1, 2, and 3
175.1								1		1-3			0	0	-	144-146	Freq. Sweep in 3 Sec.
.2					1											147-152	Freq. Sweep in 10 Sec.
. 3							-								•	153-161	Freq. Sweep in 30 Sec.
178.2							5	1	1	2	±10	2			0	187-193	Heave, Pitch in Phase
.3					-		1		1.5	1	1		1		0	194-200	Heave, Pitch in Phase

TABLE C-2 (Continued)
DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Confi No.		NPR	F	NPR	٨	H/D Ref	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	0	(•)	f <sub>a</sub> (Hz)	Y	(,)	fy	Hz)	•(•)	PIGURE NO. C-	COMMENTS
179.1	1	1	1.5	T	1.	5	5	1	2	T	0	0		10	2		0	273-279	Heave, Roll in Phase
.2	1		1		1			1.5			Ł	_ +			_L		0	280~286	Heave, Roll in Phase
180.1		T						1			±10	2					0	368~376	Heave, Pitch, Roll in Phase
. 2		1			1			1.5			1						0	377~385	Heave, Pitch, Roll in Phase
. 3							1	1			1				1		90	386~394	Roll Lags Heave & Pitch
181.1	П	1		1	1		0.8\$6.	0.3	*	T	0	0		0	0		-	395-399	VTOL Simulation  *Velocity = 0.1 fps
. 2		1						11	11									400-404	*Velocity - 1 fps
.3				1														405-409	*Velocity = 3 fps
182.1		1		1	7		2=5	1.0	+	T							-	410-414	+ Velocity = 0.06 fps
. 2					1		1	11	1									415-419	+ Velocity = 0.6 fps
.3										1								420-424	+ Velocity = 1.7 fps
184.1	2	1	1.5	T	1.	5	0.8	0	0		0	0		±10	2		-	763-766	
186.1	П	7	T	7	T		2	$T\Gamma$		T	T			<u>+</u> 6	T		-	767-771	
. 2		1	1		1		1				1			±10	1			772-776	
.3														±10	3			777-781	
187.1	П	7	7	T	7			1	2	T					2		0.	786-792	Heave, Roll in Phase
.2			1					11	3						3		0*	793-799	Heave, Roll in Phase
. 3							1		3						3		90*	800-806	Roll Lags Heave
189.2							5	0	0	I					2		_	782-785	
193.2							0.8	0.3	2.					0	0			737-739	
1942		7					2	0.5									-	740-742	
.3							1	1.0										743-745	
.4								1.5			•							746-748	
196.2				I			0.8	0	0	I	±8	2					-	755-759	
198.2		1	7	T			2			T	±10	1					-	760	
.3												3						761	
200.2							5			I		2					-	762	
201.2	П	7		1	7			1.0	2	T	0	0					-	749-751	
. 3			-		1			1.5	1		+	1						752-754	

TABLE C-2 (Continued)

DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Config.	NPRF	NPRA	R/D <sub>Ref</sub>			-	f (Hz)		f <sub>Y</sub> (Hz)	FIGURE No. C-	COMMENTS
203.2	21	1.5	1.5	0.8	0.3	2	0	0	0	0	810-812	CONTINUE
204.2		IT		2	0.5		П				813-815	,
.3				1	1.0						816-818	
.4					1.5						819-821	
206.2		$H^-$	$H^-$	5	1.0	$\neg$	Н			$\vdash$	822-824	
.3				1	1.5						825-827	
208.2		$\sqcap$	$\sqcap$		0	0	П		±10	2	840-843	
210.2		$\Pi^-$		0.8							828-831	
212.2		$\Pi^-$		2						2	832-835	
.3										3	836-839	
214.2	22	1.5	1.5	0.8	0.3	2	0	0	0	0	807-809	
227.2	3	1.5	4.4	0.8	0.3	2	0	0	0	0	858-860	
228.2				2	0.5						861-866	
.3					1.0						867-872	
.4					1.5						873-878	
230.2				0.8	0	0			± <sub>10</sub>	1	943-946	
.3					•	•			•	2	909-912	
232.2					0.3	2			± <sub>10</sub>	2	955-961	φ = 0° Heave, Roll in Phase
234.1		П		2	0	0				1	947-950	
. 2				1	1	1				2	913-916	
.3										3	951-954	
235.1		П			1.0	1	П		0	0	925-927	
.2					1	2			1	1	879-881	Repeat Run 228.3
.3						3					928-930	
236.2						2			±10	2	962-967	¢ = 0° Heave, Roll in Phase
. 3									•	1	968-973	¢ = 90° Roll Lags Heave
238.2				5	0.5				0	0	882-884	
. 3					1.0				1	1	885-887	
.4					1.5						888-890	
240.2					0	0			±10	2	917-920	
243.2				8							921-924	
244.2					1.0	2			0	0	891-893	
.3		_			1.5	•					894-896	
247.3	1	1.5	1.0	2	0	0			±10	2	1046-1049	
248.2	3	1.5	1.0	2	1.0	2	0	0	0	0	1034-1036	
.3					1.5						1037-1039	
250.2				5	1.0						1040-1042	
. 3					1.5		1	1	1	1	1043-1045	

TABLE C-2 (Continued)
DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Config.	NPRF	NPRA	H /D Ref	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	f <sub>a</sub> (Hz)	γ(*)	f <sub>y</sub> (Hz)	FIGURE NO. C-	COMMENTS
252.1	3	1.1	4.4	5	1.0	2	0	0	0	0	1010-1012	OURIDATE
.2	1	1	1		1.5	1	1		1	1	1013-1015	
254.1		2.0	2.0		1.0	0	$\vdash$			$\vdash$	1028-1030	
.2		1	1		1.5	1					1031-1033	
258.2		1.1	4.4	0.8	0.3	2	$\vdash$				998-1000	
259.2		T		2	0.5		$H^-$				1001-1003	
.3				1	1.0						1004-1006	
.4					1.5						1007-1009	
261.2		2.0	2.0	0.8	0.3						1016-1018	
262.2		$\top$	T	2	0.5						1019-1021	
.3					1.0						1022-1024	
.4					1.5						1025-1027	
264.2			1.0		1.0						1050-1052	
.3			1		1.5						1053-1055	
266.2					0	0			± <sub>10</sub>	2	1060-1063	
269.2		1.5	4.4	0.8	0	0	<u>+</u> 6	1	0	0	931-933	
.3		1	1		1	1	1	2	1	1	897-899	
.4								3			934-936	
271.2				2			±10	1			937-939	
.3								2			900-902	
.4								3			940-942	
273.2	$\vdash$	<del>                                     </del>	$\vdash$	5	-		$\vdash$	2	$\vdash\vdash$	+-	903-905	
274.2		2.0	1.0		1.0	2	0	0	$\vdash$	$\forall \vdash$	1056-1057	
.3		1	1		1.5		ı				1058-1059	
278.2		1.5	4.4	8	0	0	± <sub>10</sub>	2	0	0	906-908	
279.2				1.3=5.7	0.3	2*	0	0			974-977	VTOL Simulation
				1	1		1	1			070 001	*Velocity = 0.1 fps
.3											978-981	* Velocity = 1.0 fps
.4		-		2 - 1			-		-	$\vdash$	982-985	* Velocity = 3.0 fps  * Velocity = 0.1 fps
280.2				2 = 5	1.0						986-989 990-993	* Velocity = 0.1 fps
.3											990-993	* Velocity = 1.0 fps
282.2	31	-	-	2	0	0	±10	1	-	H	1077-1079	velocity - 5.0 tps
284.2		-	-	0.8	0.3	2	0	0	-	-	1064-1065	
285.1		H-	-	2	1.0	1			-	-	1072	
.2				1	0.5	2					1066-1067	
.3					1.0						1068-1069	
.4					1.5						1070-1071	
287.2	32	1	-	0.8	0.3		-		-	+	1089-1090	
207.2	32	Ш		0.6	0.3						1003-1030	

TABLE C-2 (Continued)

DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Config.	NPRF	NPRA	H/D <sub>Ref</sub>	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	fa (H	z)	Y(*)	f (Hz)	FIGURE NO. C-	COMMENTS
288.2	32	1.5	4.4	2	1.0	2	0	0	T	0	0	1091-1092	
.3	1	1	1		1.5		1	1		1	1	1093-1094	
291.2			$H^-$	0.8	0	0			1	±10	2	1095-1097	
293.2				2		1			1	-		1098-1100	
295.2	31	1.5	4.4	0.8	0	0	0	0	1	+10	2	1080-1082	
297.2				2					T			1083-1085	
300.2				5					1			1086-1088	
301.2					1.0	2				0	0	1073-1074	
.3					1.5	+						1075-1076	
305.2	33	1.5	4.4	2	0.5	2 ·	0	0		0	0	1101-1102	
.3					1.0	1	-			1		1103-1104	
.4					1.5	•	•			1	•	1105-1106	
307.2	34	1.5	4.4	0.8	0.3	2	0	0		0	0	1107-1108	
308.2				2	0.5							1109-1110	
.3					1.0							1111-1112	
.4					1.5					,		1113-1114	
309.2				0.8	0	0				±10	2	1119-1121	
312.1				2						•		1122-1124	
314.1				5	1.0	2			1	0	0	1115-1116	
314.2					1.5				1	1		1117-1118	
317.2	35	1.5	4.4	0.8	0.3	2	0	0		0	0	1153-1154	
318.2				2	0.5				T			1155-1157	
.3					1.0							1158-1160	
.4					1.5	1						1161-1163	
.5					+	3				•		1164-1166	
320.2				0.8	0	0				± <sub>10</sub>	2	1180-1182	
322.2				2					T		•	1183-1186	
.3											3	1187-1190	
325.2				5	•	•			1		2	1191-1193	
326.2					1.0	2				0	0	1167-1168	
.3					1.5	+	•					1169-1170	
328.2				•	0	0	±10	2				1177-1179	
331.2				2								1174-1176	
333.2				0.8		1	±6			1	1	1171-1173	
335.2	36	1.5	4.4	0.8	0	0	+6	2	1	0	0	1141-1143	
337.1					0.3	2	0	0				1125-1127	
338.1				2	0.5							1128-1123	
.2				+	1.0			1		-	•	1131-1133	

TABLE C-2 (Concluded)

DYNAMIC DATA SUMMARY IN NUMERICAL SEQUENCE

Run No.	Config.	NPRF	NPRA	R/D Ref	h/D <sub>Ref</sub>	f <sub>h</sub> (Hz)	a(*)	f <sub>a</sub> (Hz)	Y(*)	f <sub>Y</sub> (Hz)	FIGURE NO. C-	COMMENTS
338.3	36	1.5	4.4	2	1.5	2	0	0	0	0	1134-1136	
340.2				0.8	0	0			±10	2	1144-1146	
342.2				2							1147-1149	
347.2				5							1150-1152	
348.2					1.0	2			0	0	1137-1138	
.3					1.5					1	1139~1140	
351.2	38	1.5	1.5	0.8	0.3	2	0	0	0	0	1194~1195	
352.2				2	0.5						1196~1197	
. 3				11	1.0						1198-1199	
.4		·			1.5						1200-1201	
354.2				0.8	0	0			±10	2	1206-1208	
355.1				2							1209-1211	
361.2				5							1212-1214	
362.2					1.0	2			0	0	1202-1203	
.3					1.5	1					1204-1205	
367.2	39	1.5	1.5	5	0	0	0	0	±10	2	1243-1245	
368.2					1.0	2			0	0	1229-1230	
.3					1.5						1231-1232	
370.2				0.8	0	0			±10	2	1234-1236	
371.1										2	1237-1239	
. 2				2						3	1240-1242	
376.3				0.8	0.3	2			0	0	1215-1216	
377.1				2	0.5	2					1217-1219	
.2				1	1.0						1220-1222	
.3					1.5						1223-1225	
.4					1.5	3					1226-1228	
379.2					0	0	±10	2			1233	
384.2	1	1.5	1.5	2	1.5	2	0	0	0	0	28-30	Repeat Run 90.2
932.2	4	1.5	1.5	0.8	0.3	2 .	0	0	0	0	844-845	
933.2				2	1.0						846-847	
.3					1.5						848-849	
939.1				5	1.0						850-851	
.2				1	1.5						852-853	
935.2				2	0	0			±10	2	854-857	

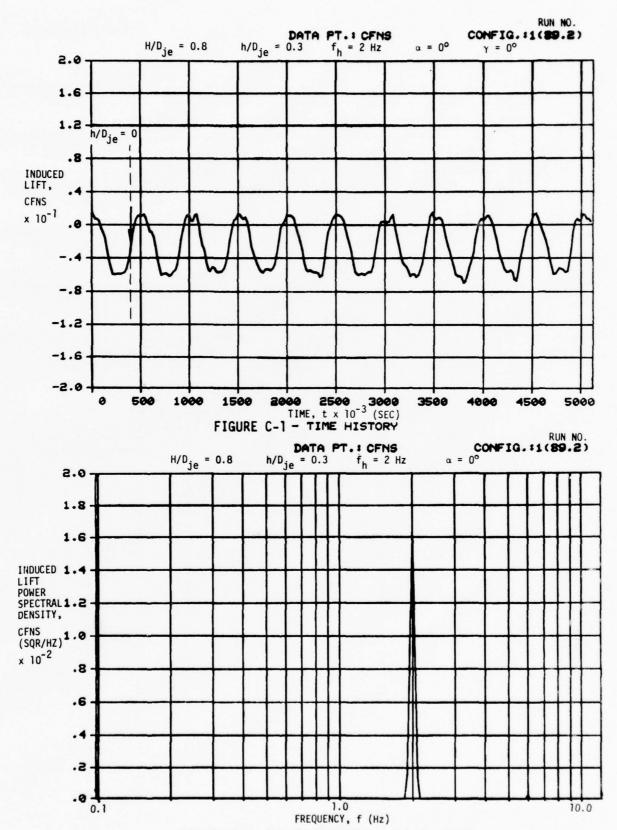
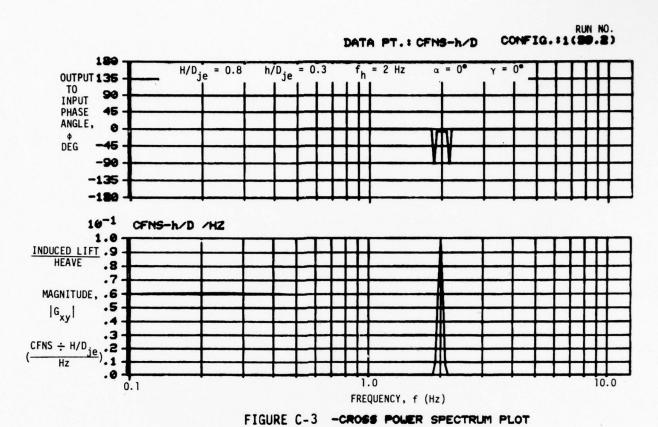
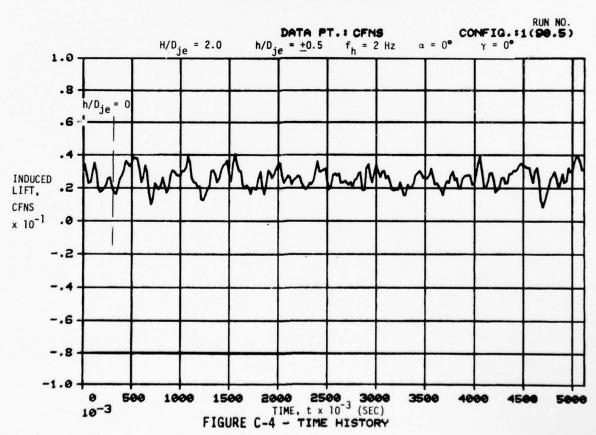
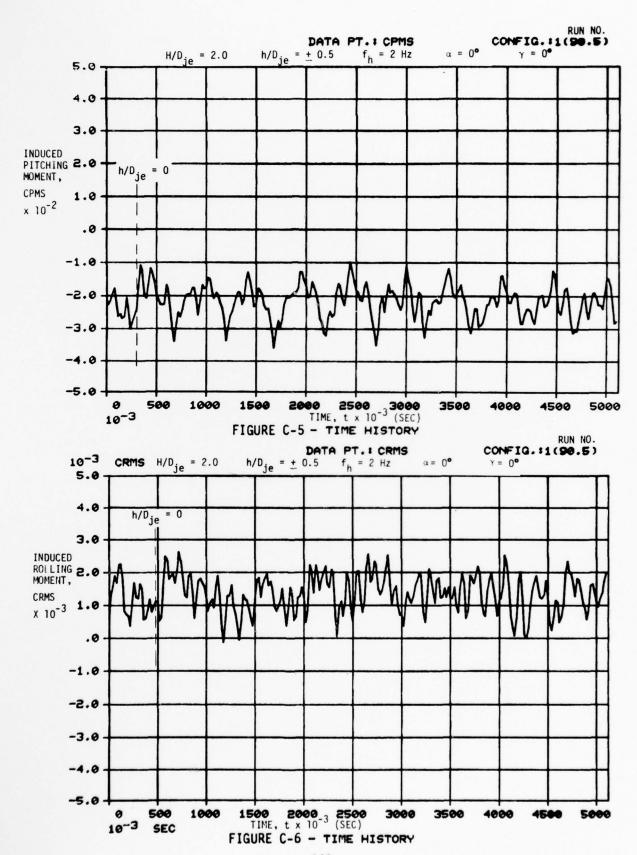
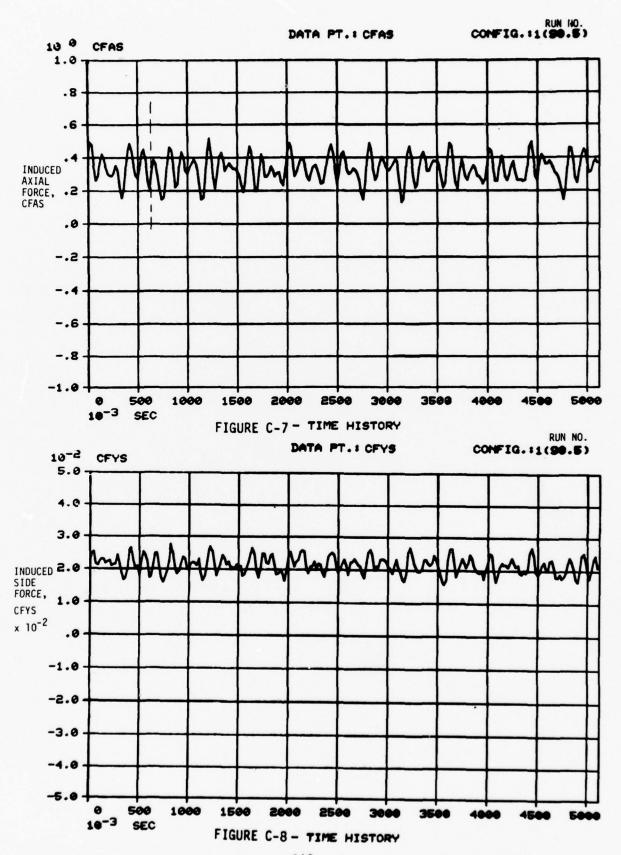


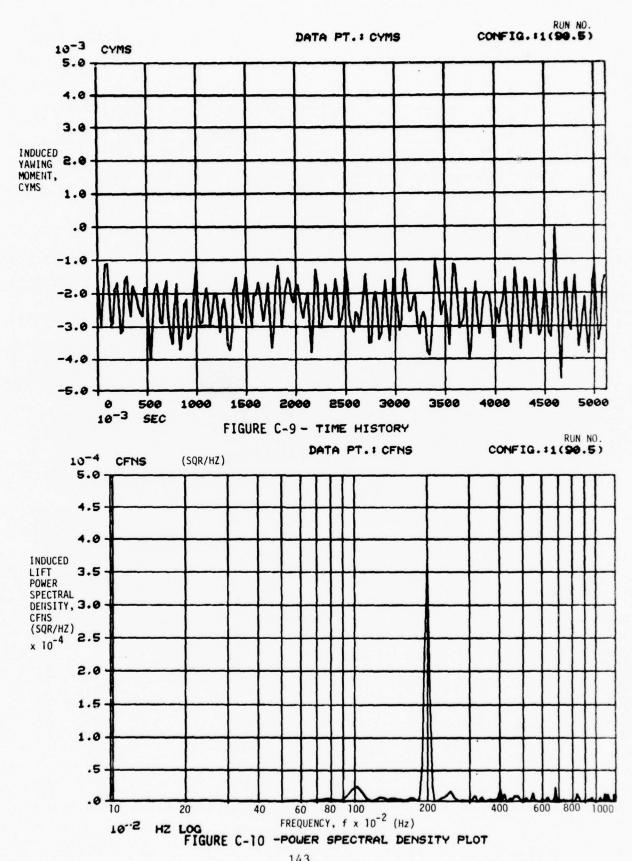
FIGURE C-2 -POWER SPECTRAL DENSITY PLOT











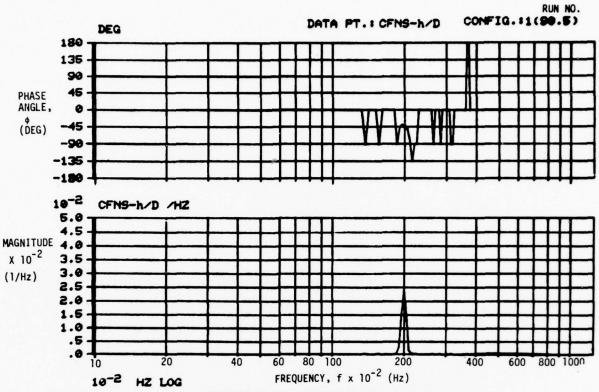
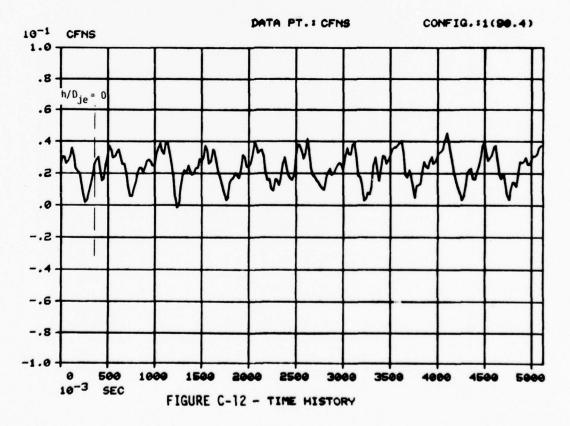
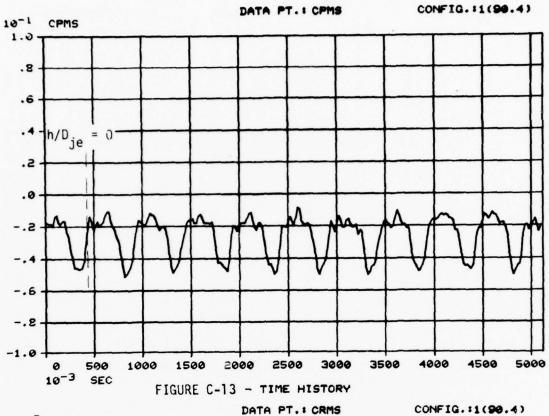
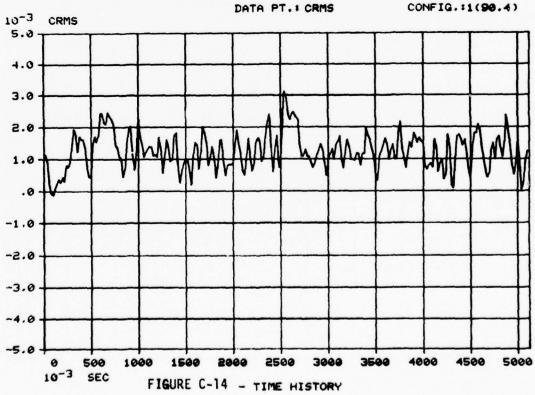
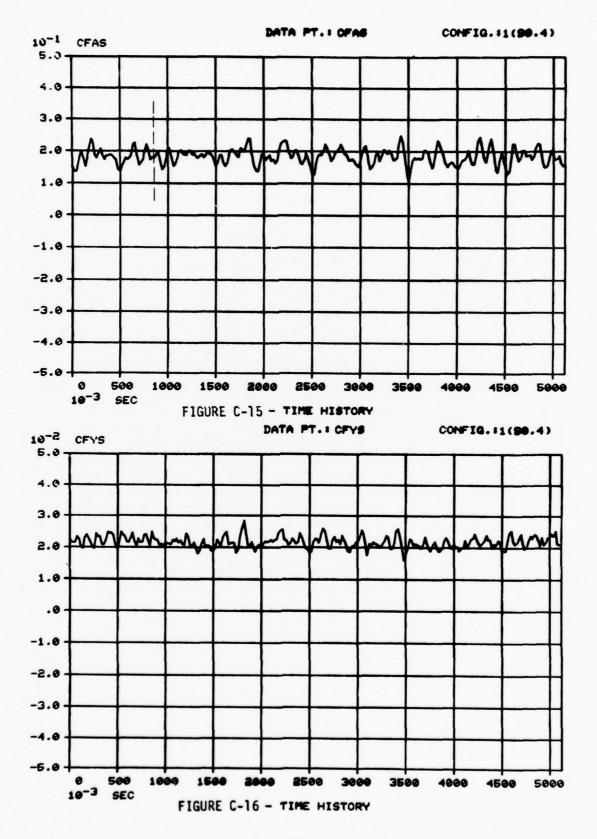


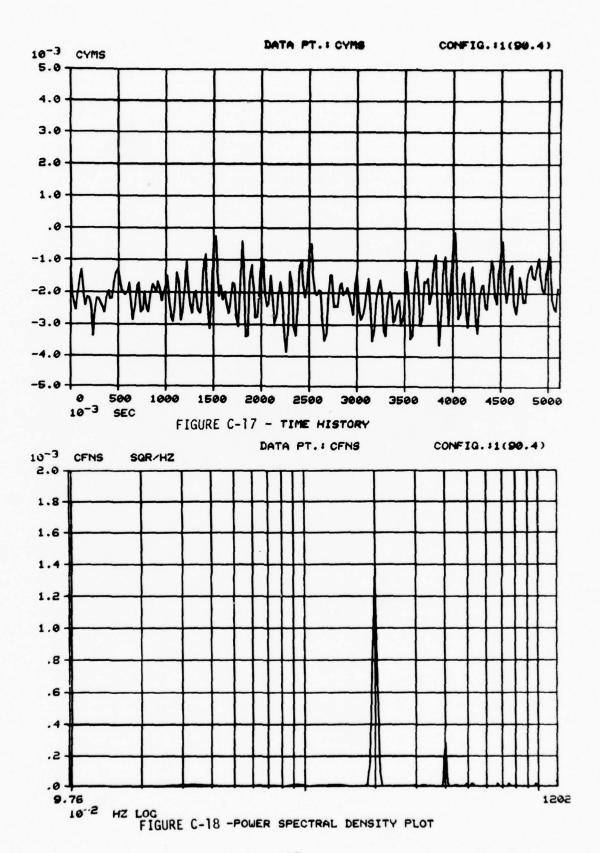
FIGURE C-11 -CROSS POWER SPECTRUM PLOT











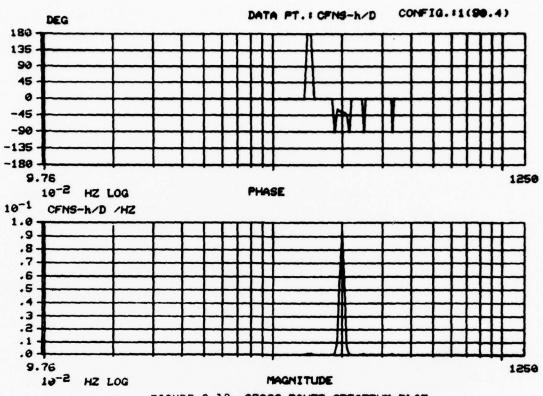
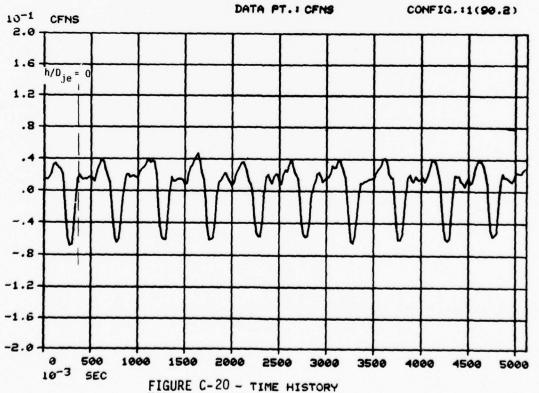
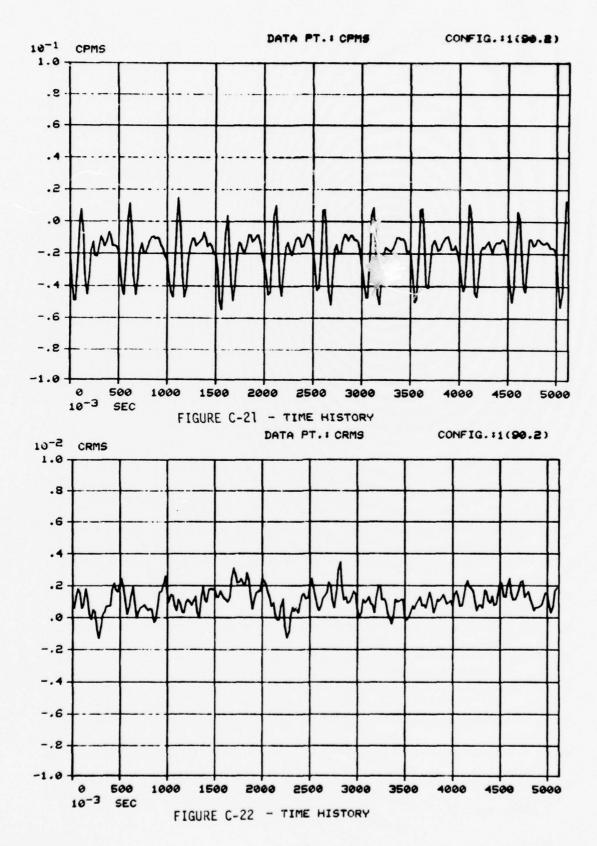
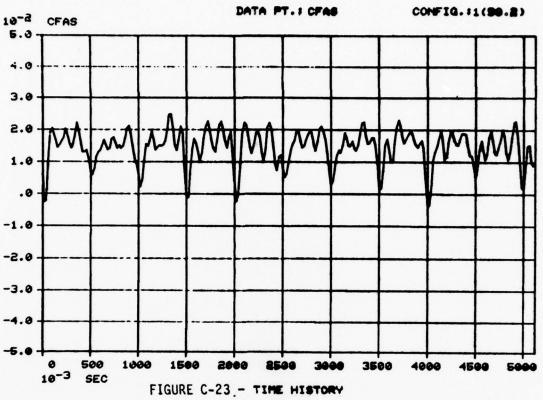
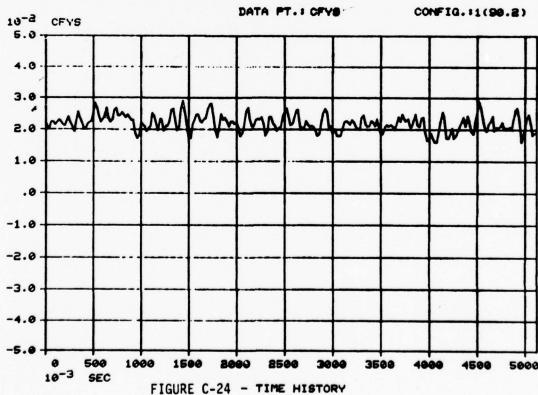


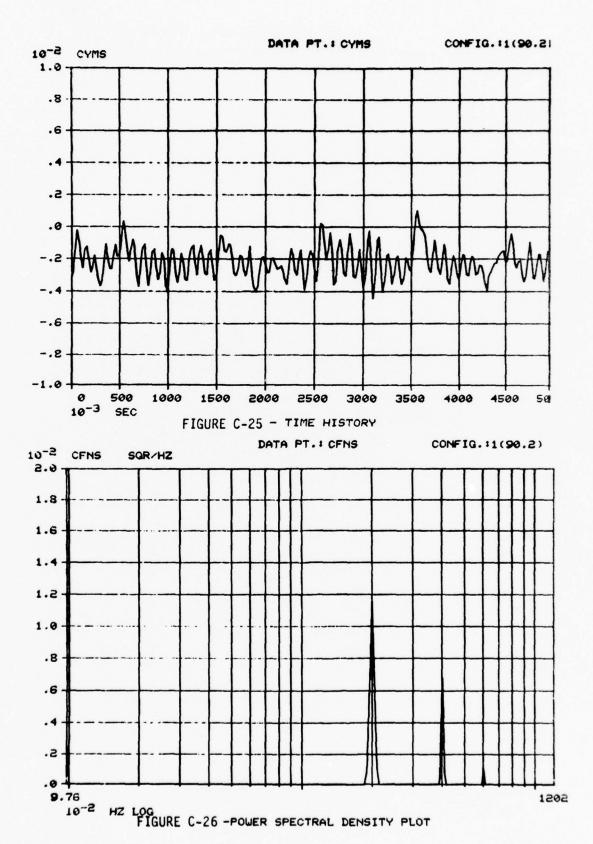
FIGURE C-19 -CROSS POWER SPECTRUM PLOT











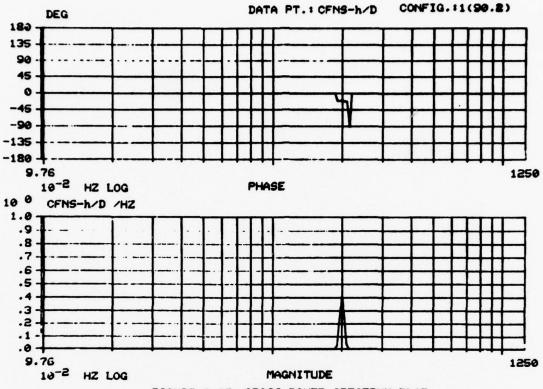
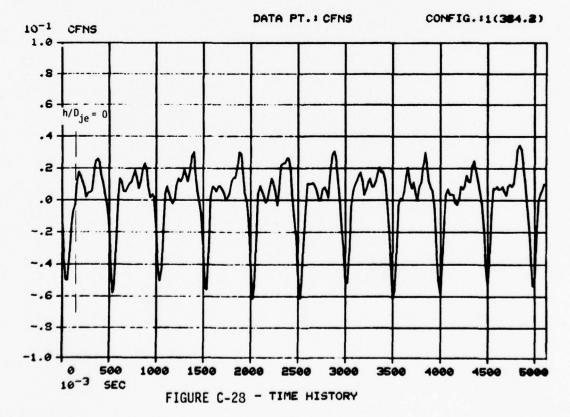
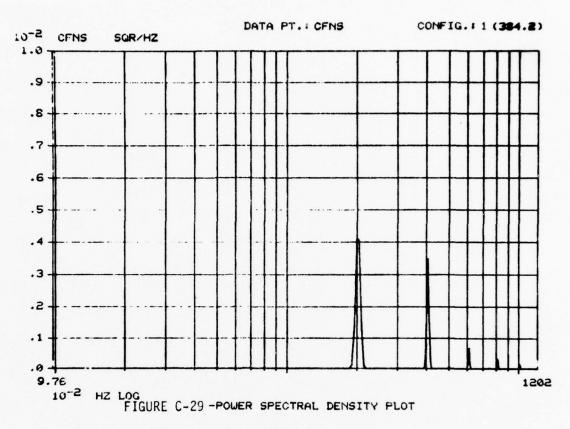
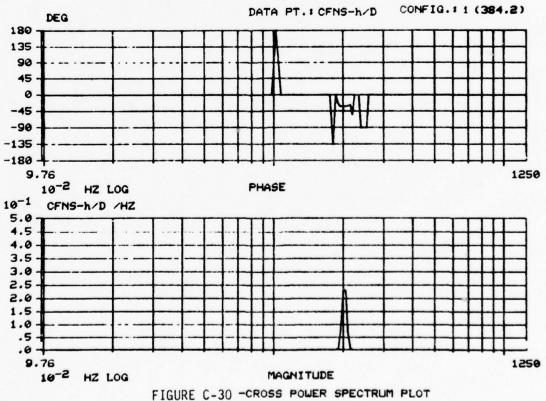


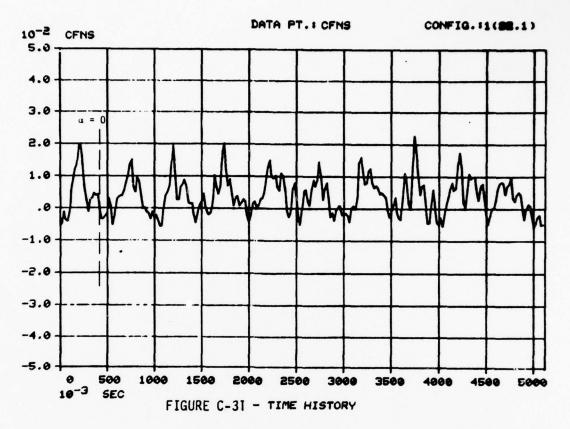
FIGURE C-27 -CROSS POWER SPECTRUM PLOT

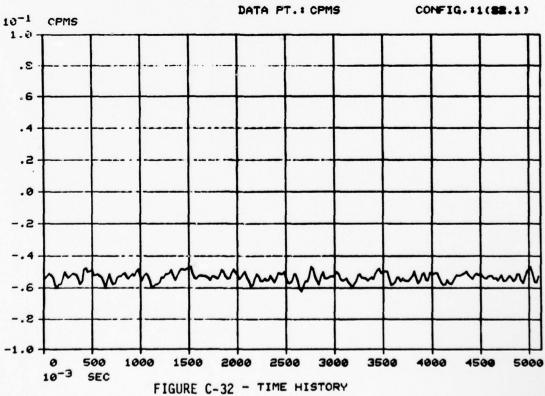


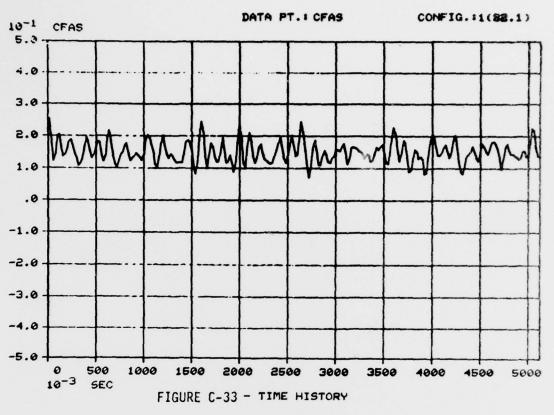
152

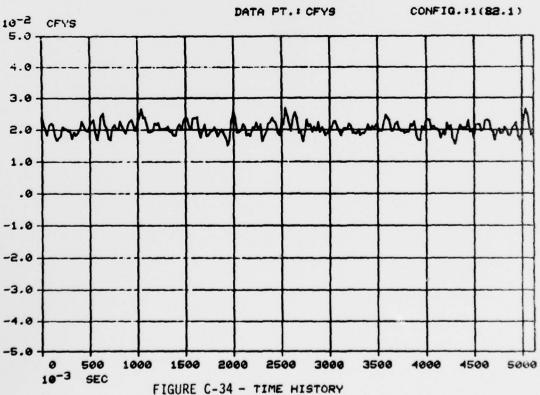


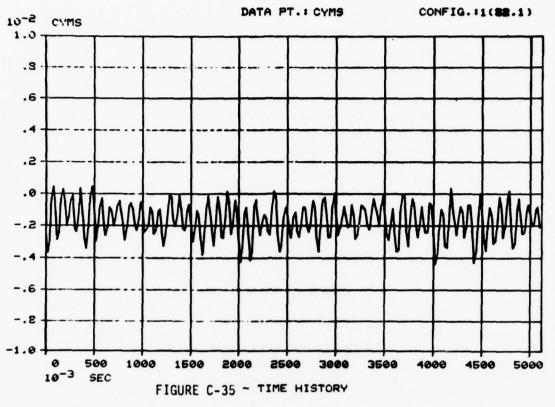


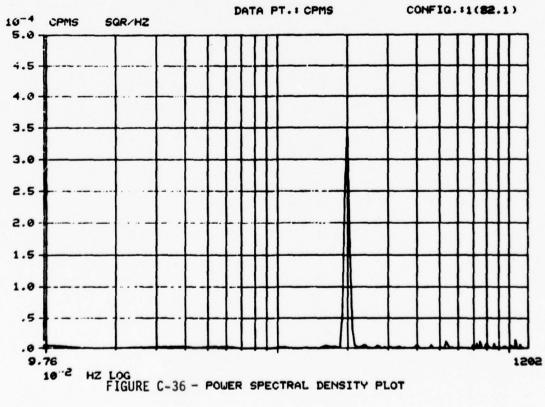












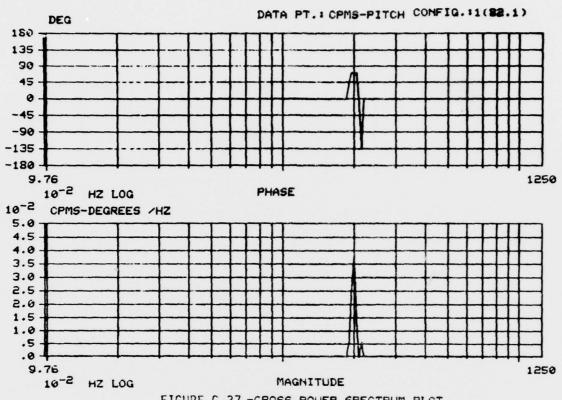
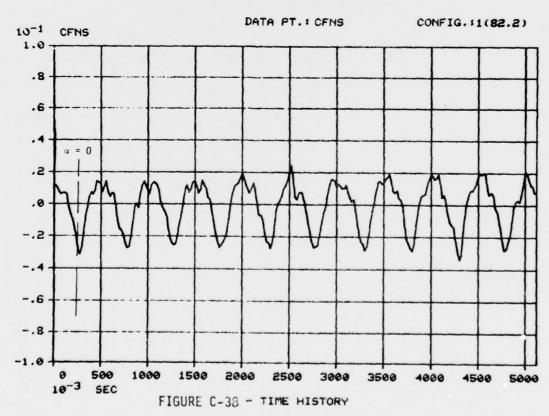
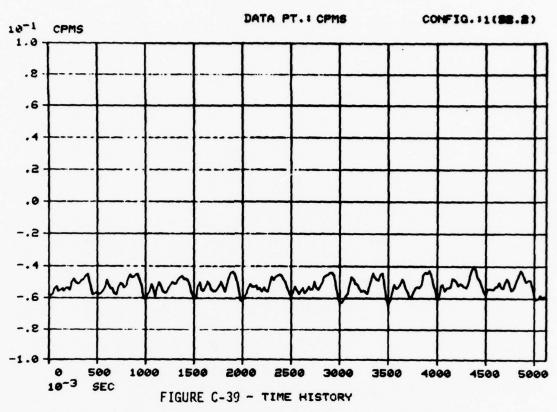
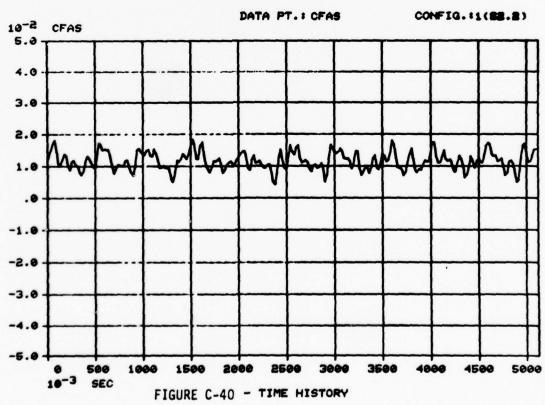
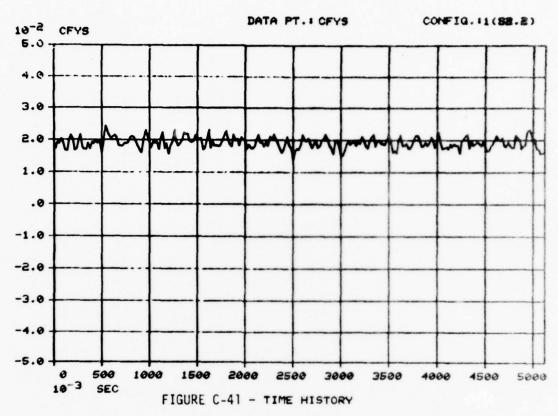


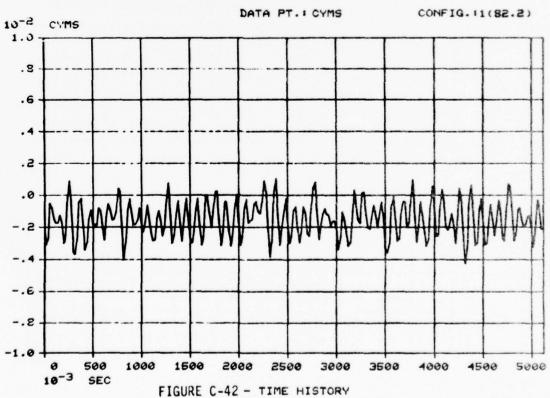
FIGURE C-37 -CROSS POWER SPECTRUM PLOT

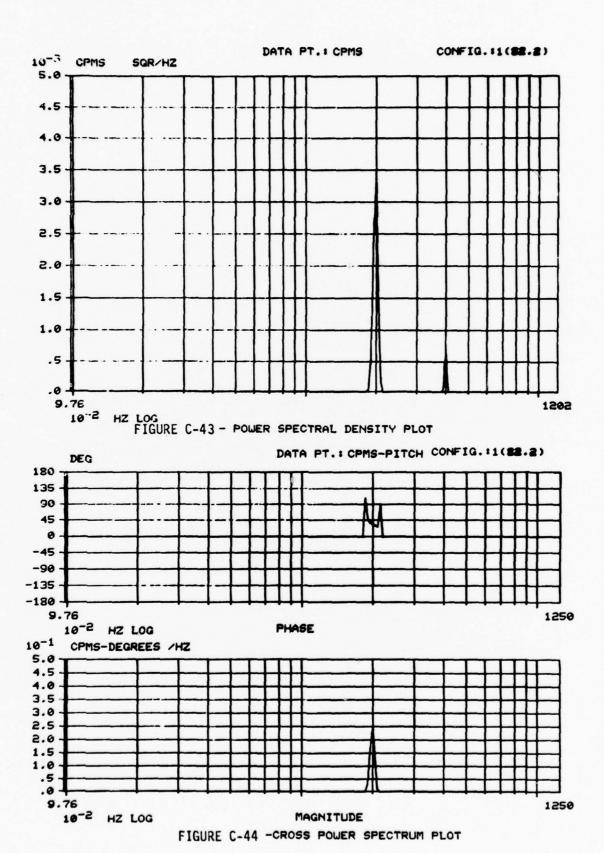


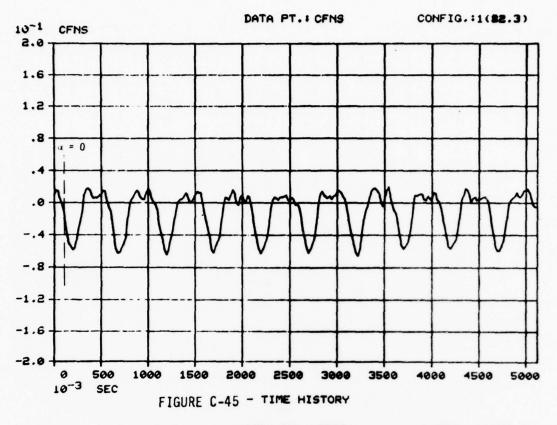


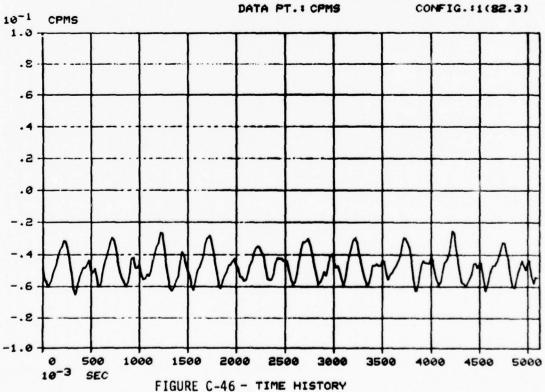


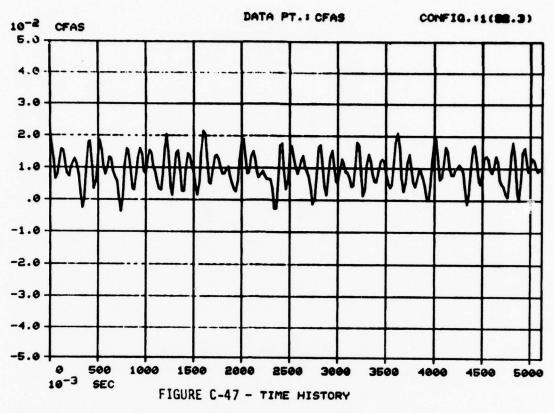


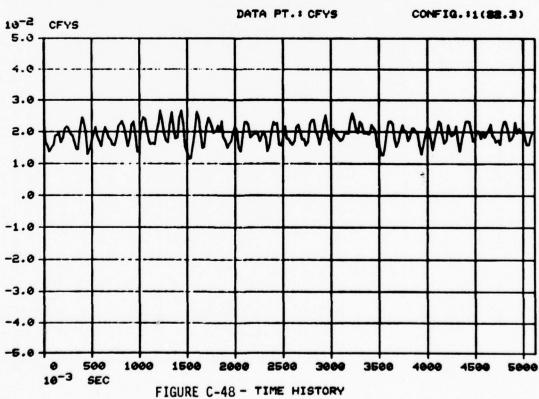


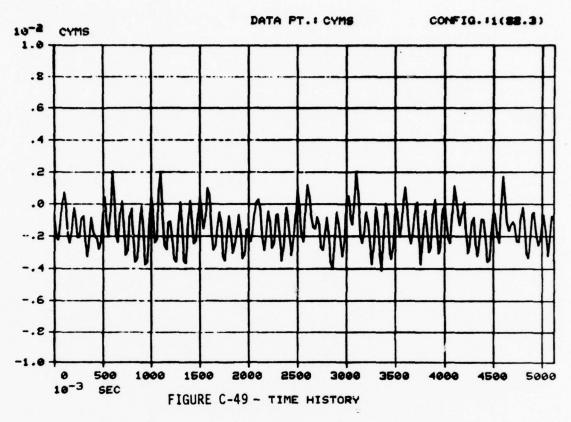


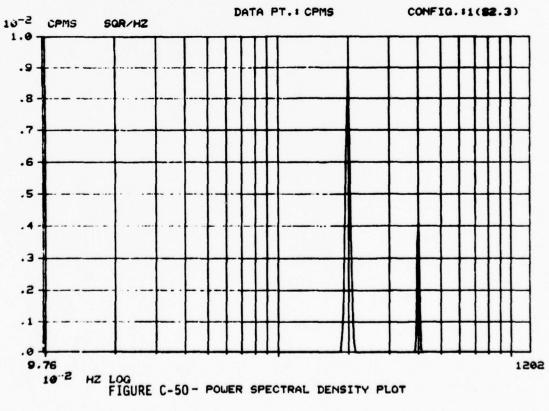


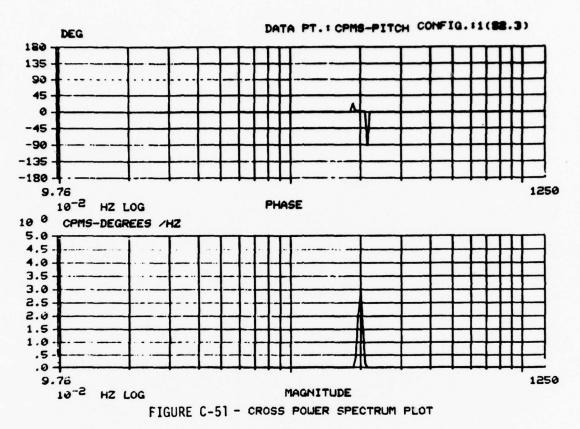


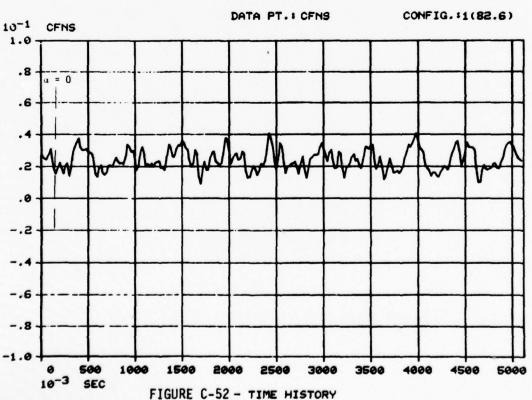


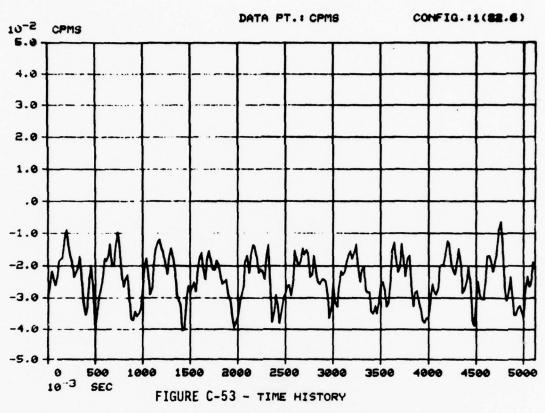


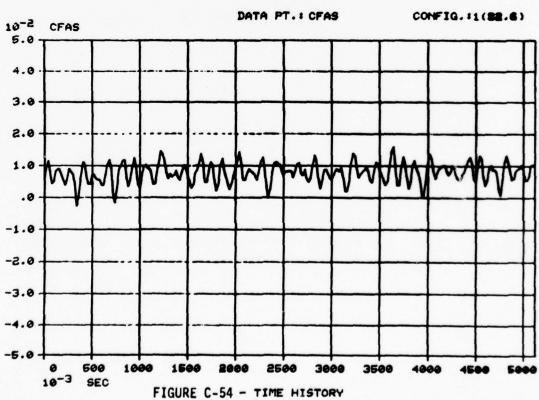


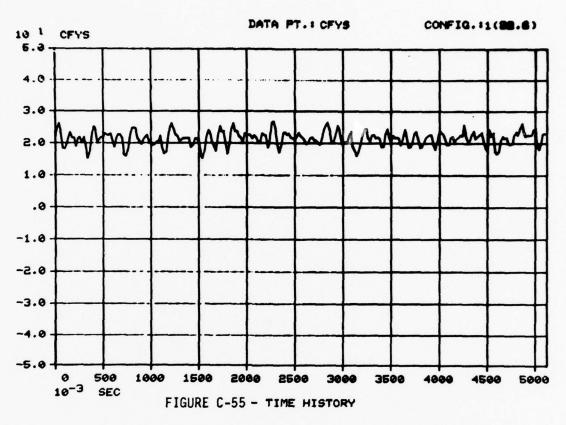


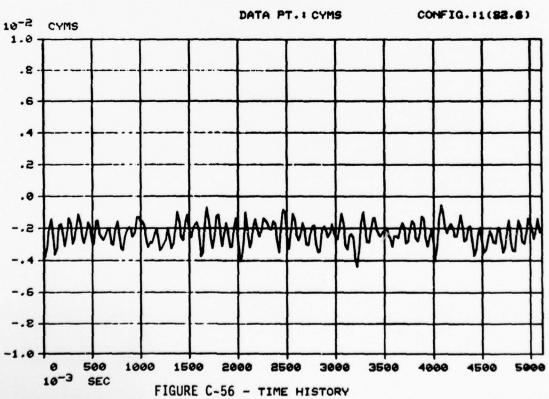


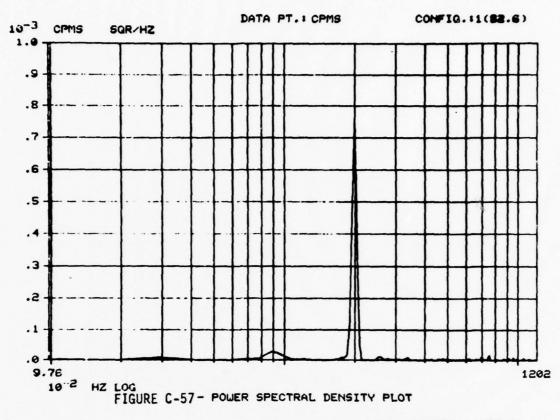


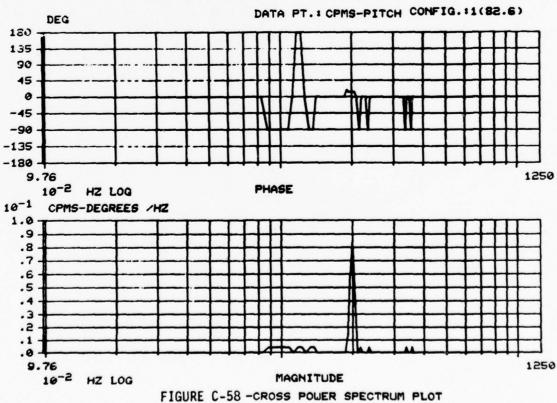


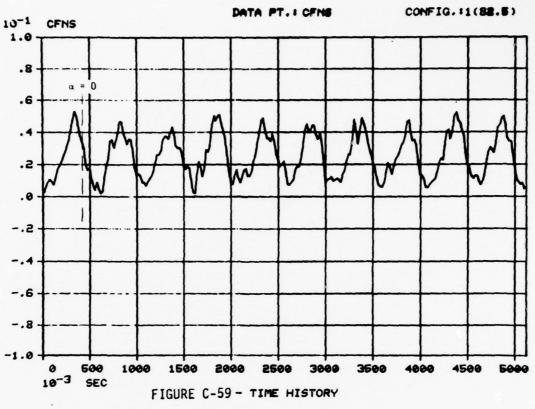


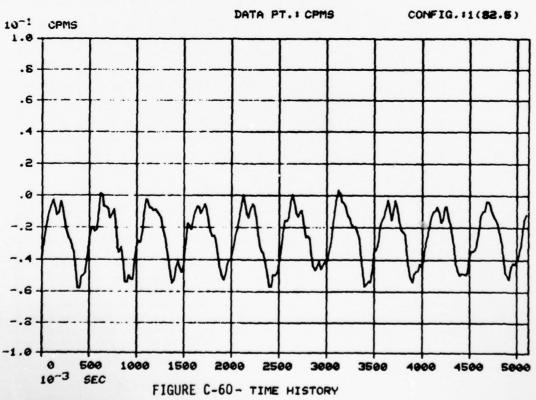


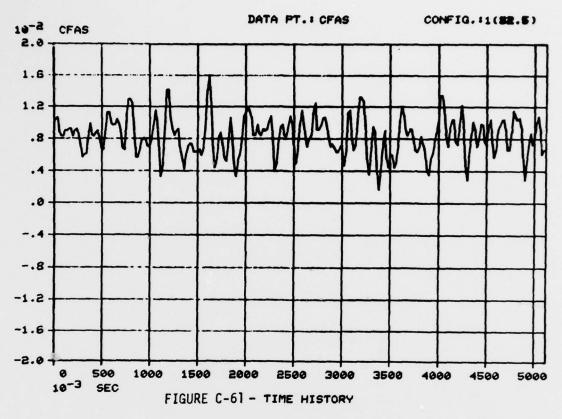


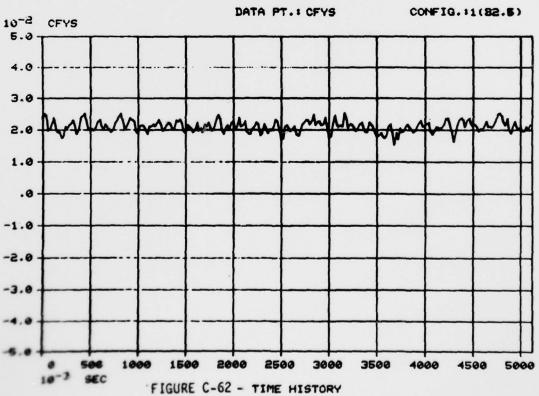


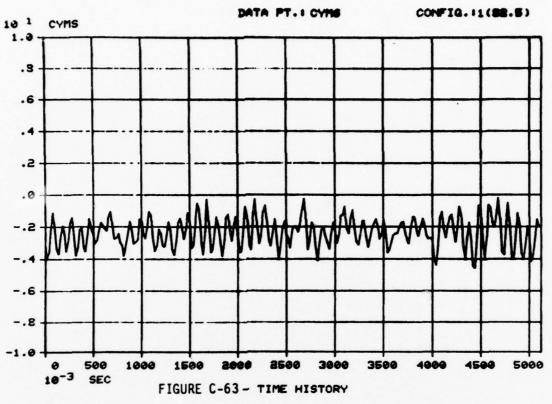


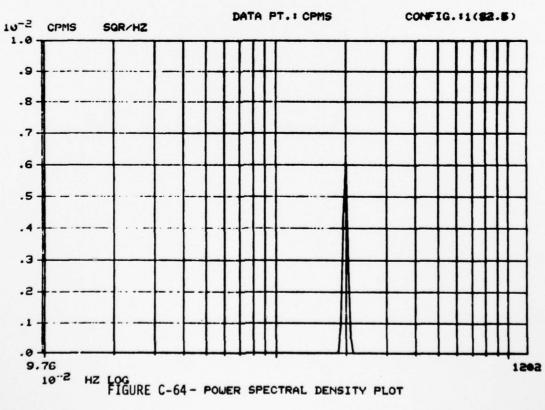


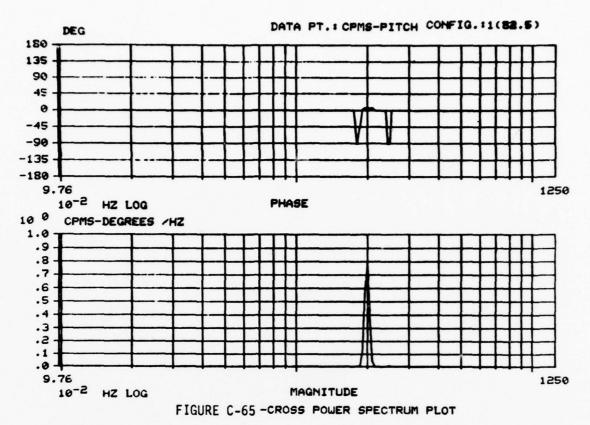


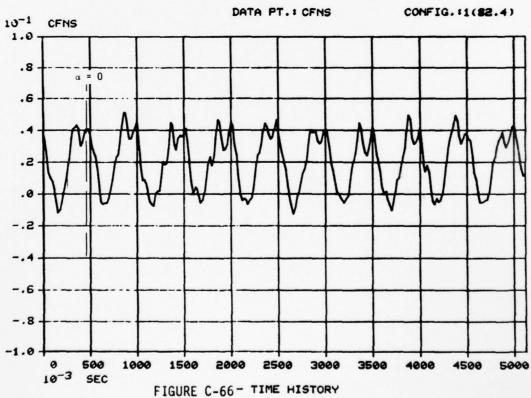


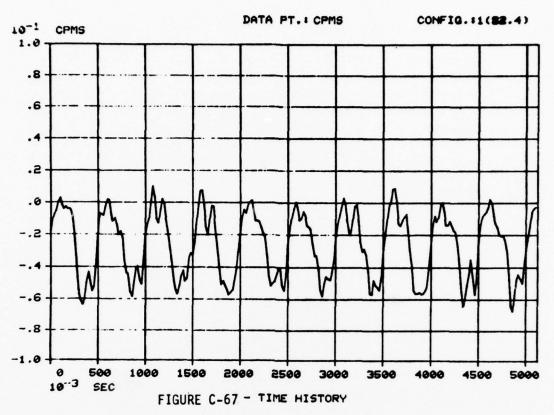


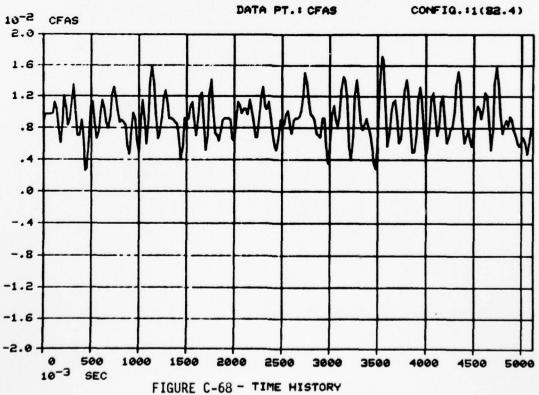


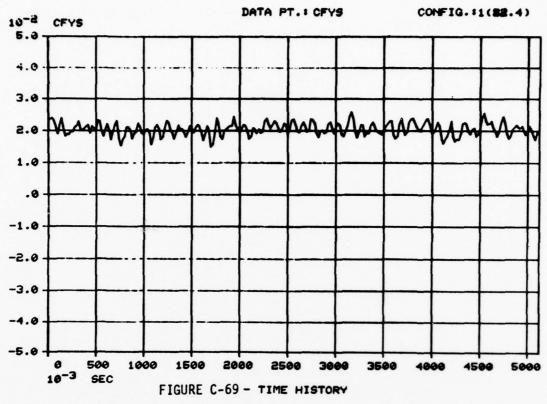


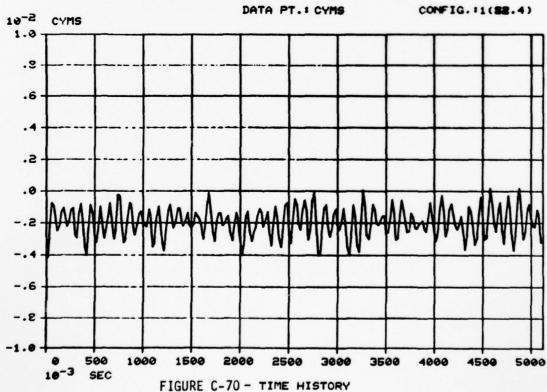


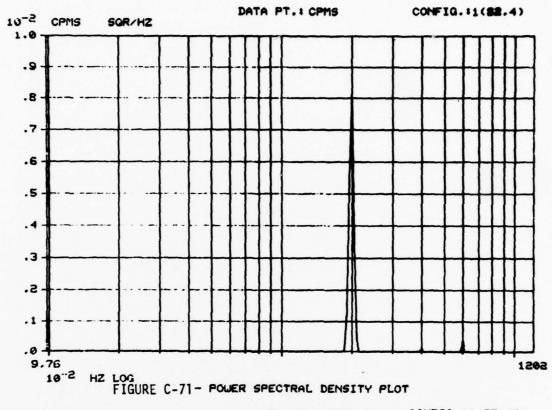












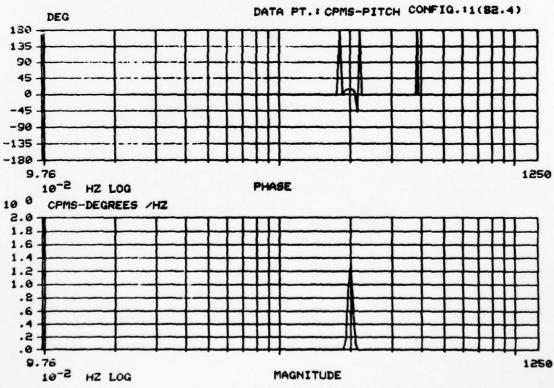
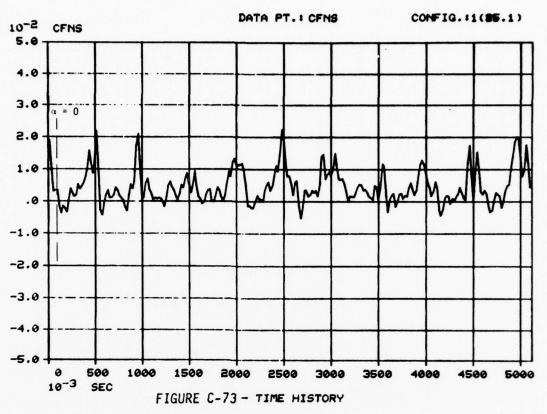
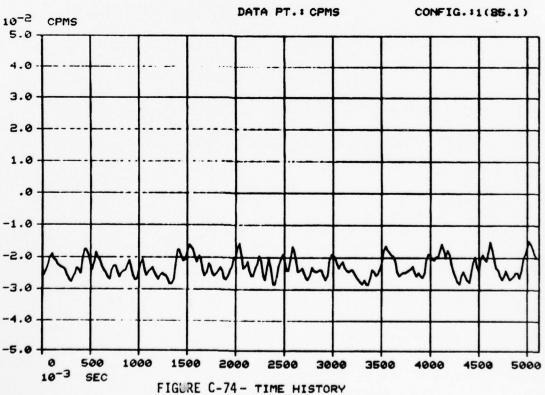
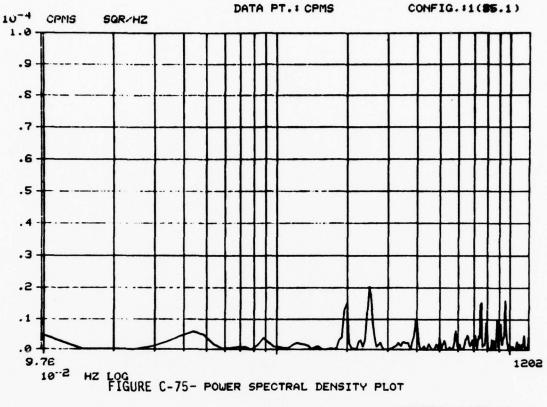


FIGURE C-72 -CROSS POWER SPECTRUM PLOT







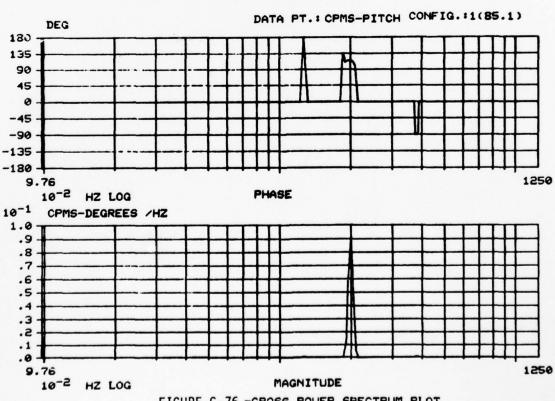
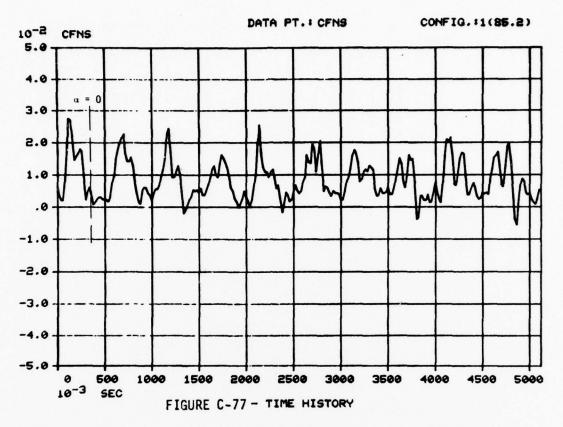
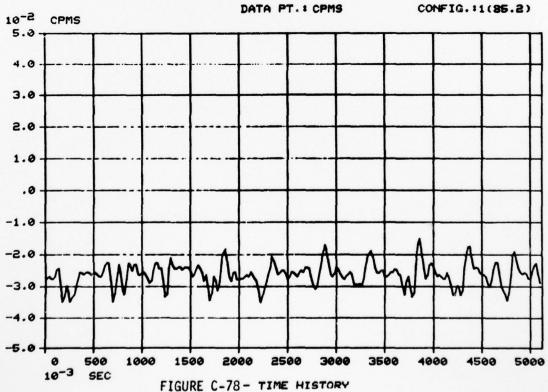
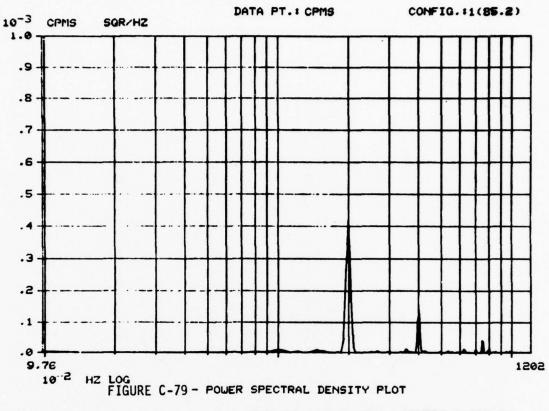
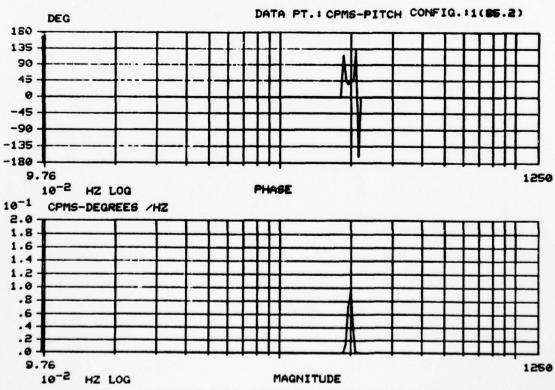


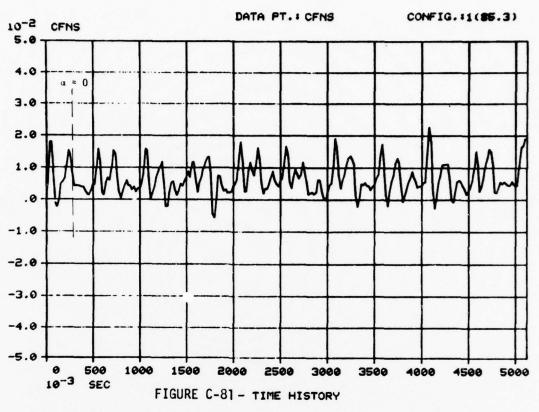
FIGURE C-76 -CROSS POWER SPECTRUM PLOT

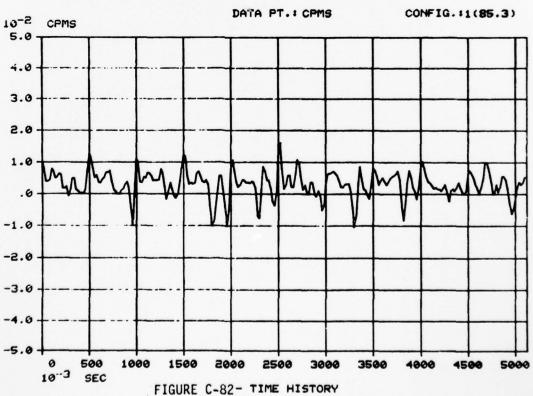


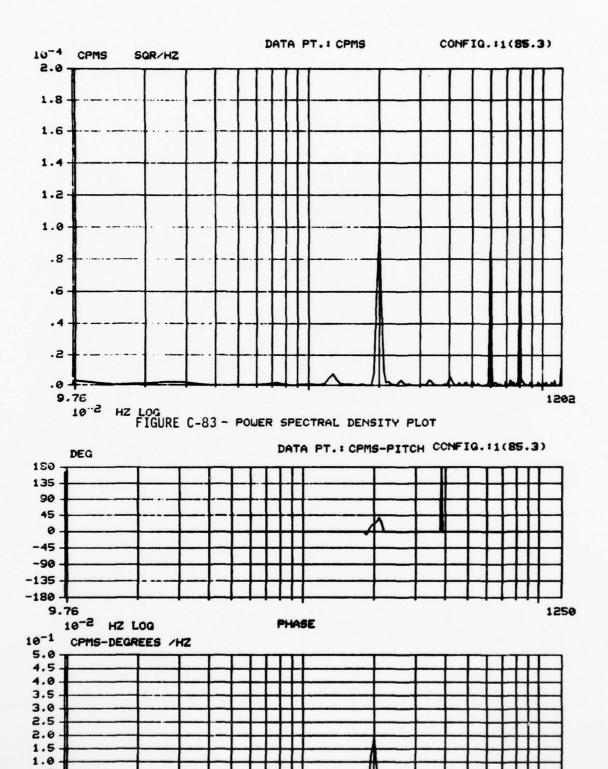










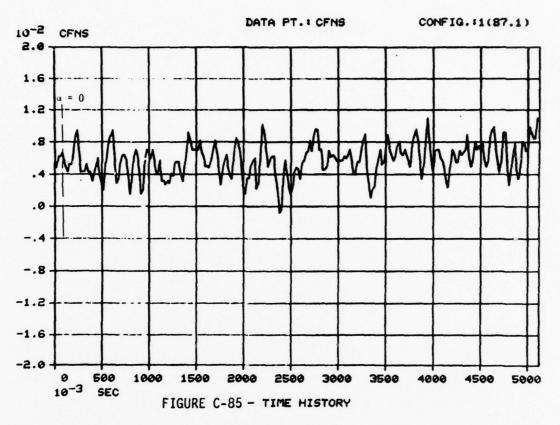


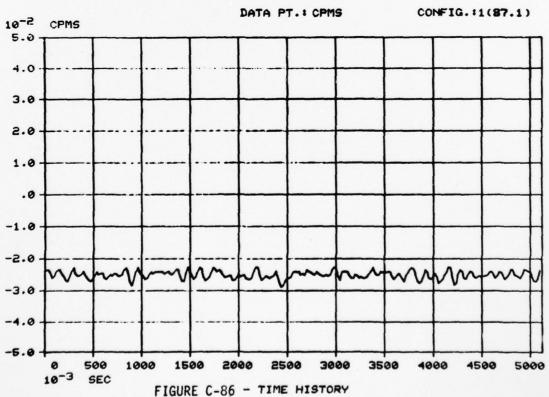
MAGNITUDE
FIGURE C-84 -cross Power Spectrum PLOT

1250

9.76

10-2 HZ LOG





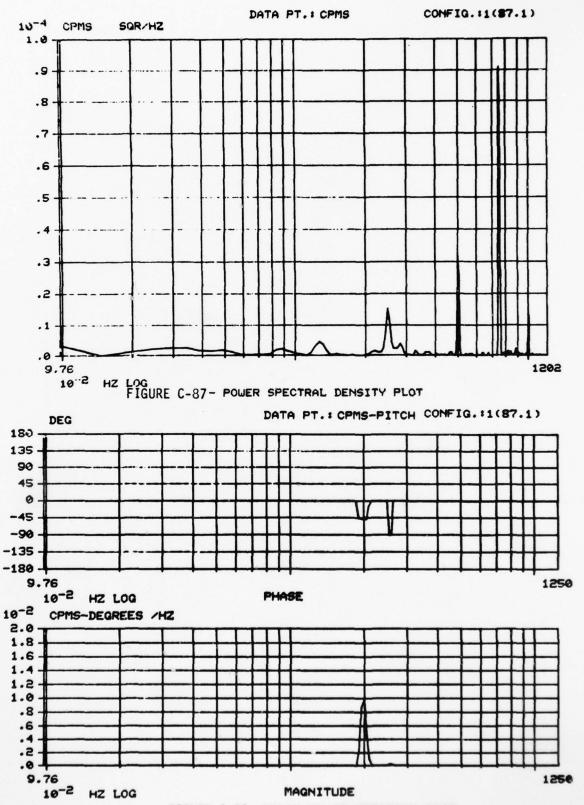
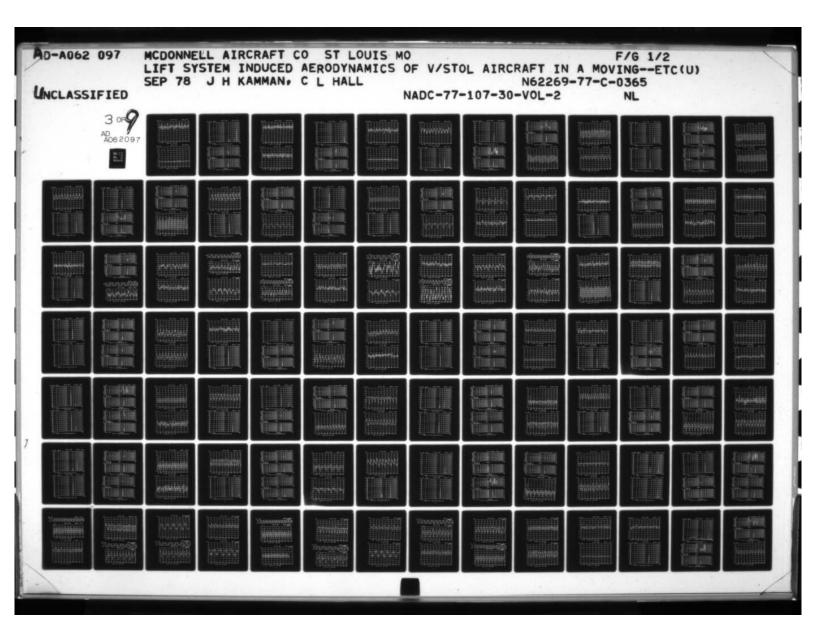
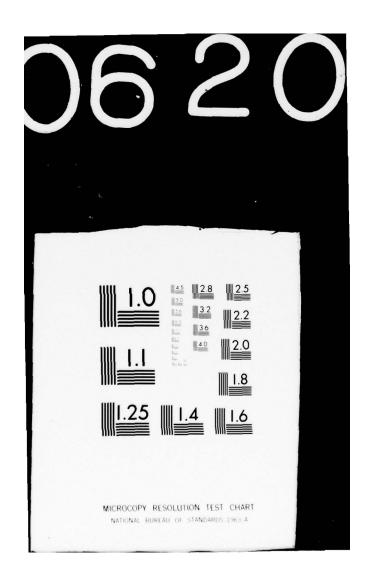
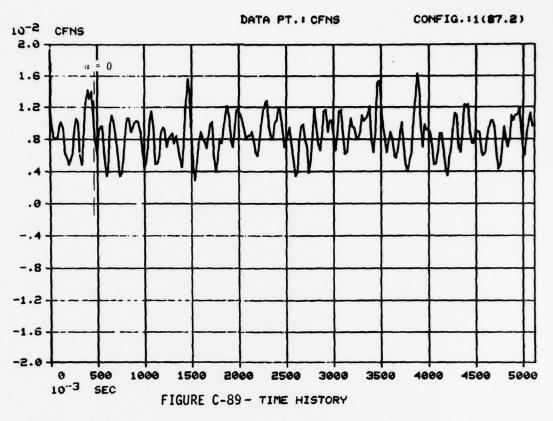
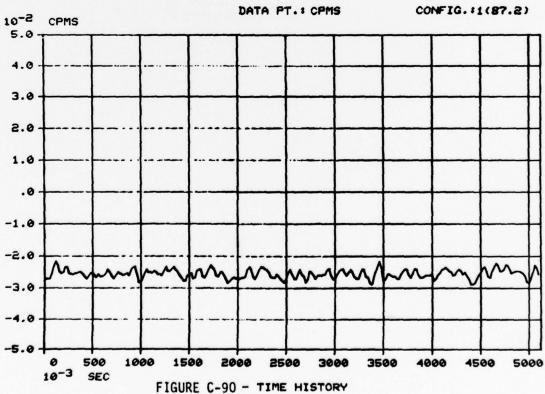


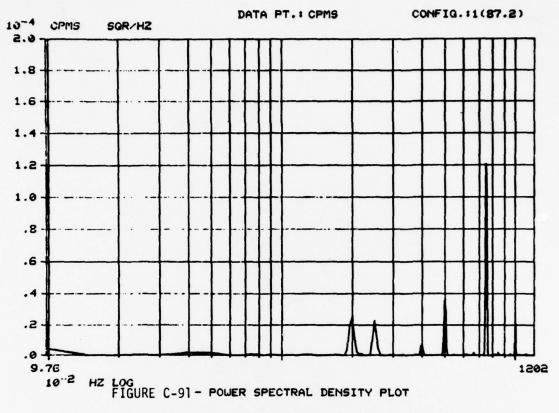
FIGURE C-88 -CROSS POWER SPECTRUM PLOT

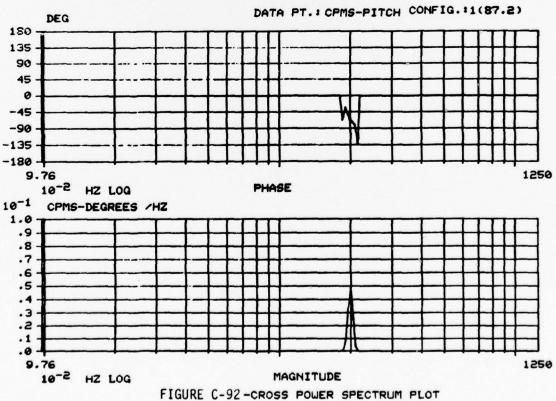


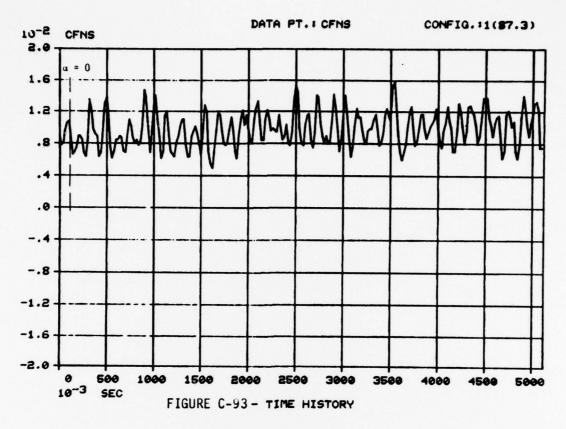


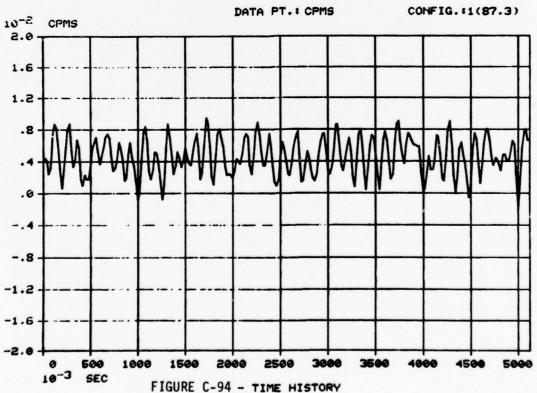


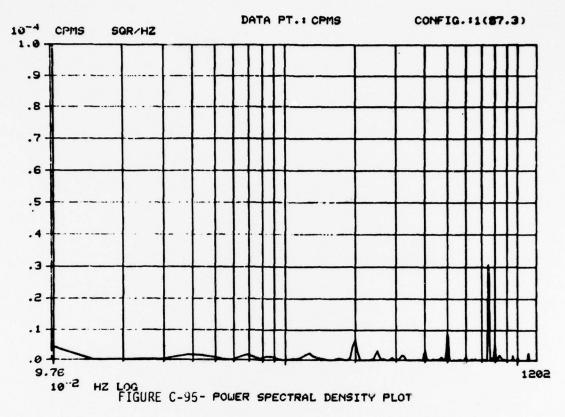


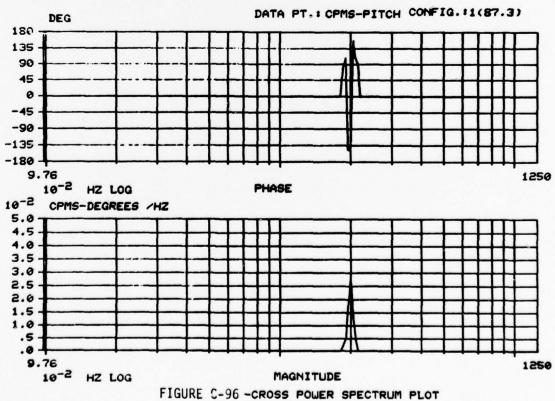


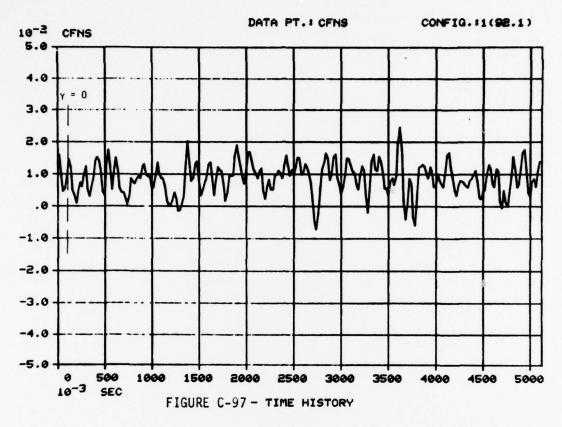


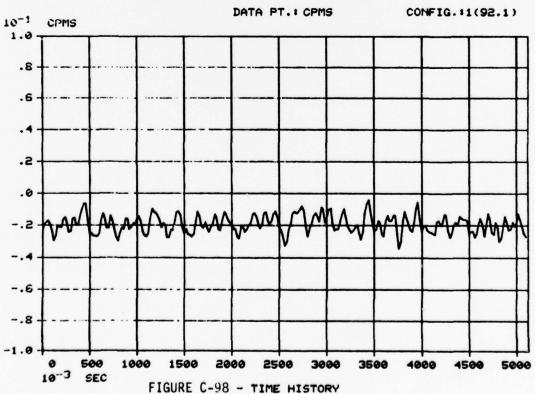


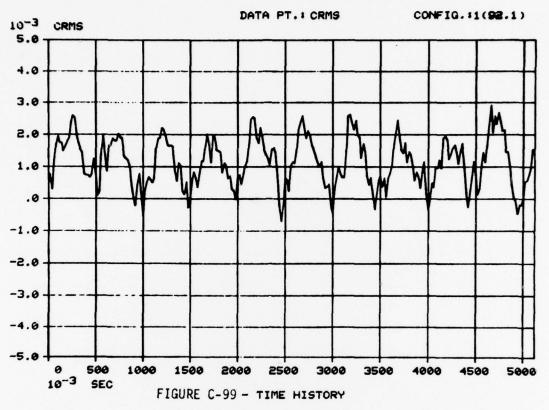


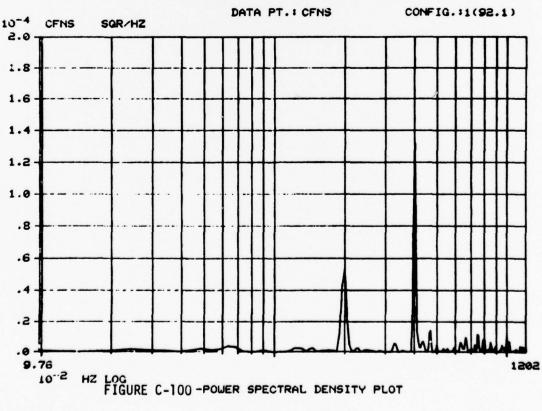


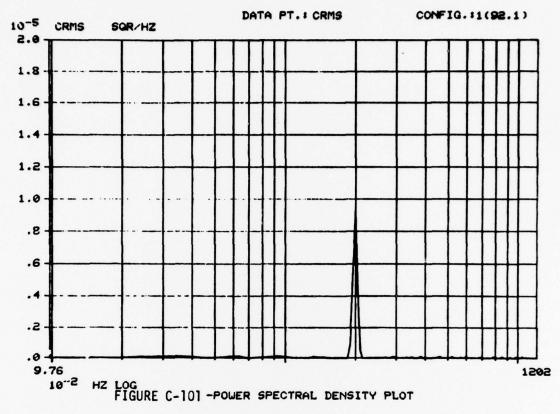


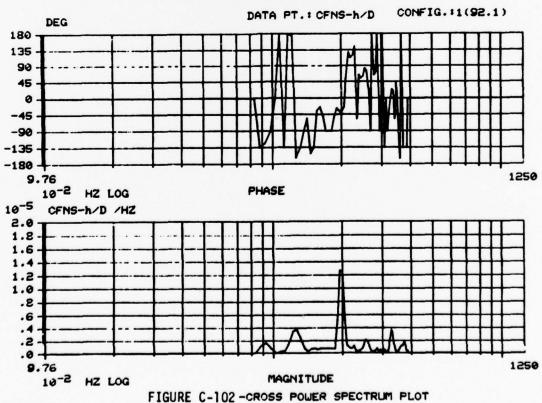


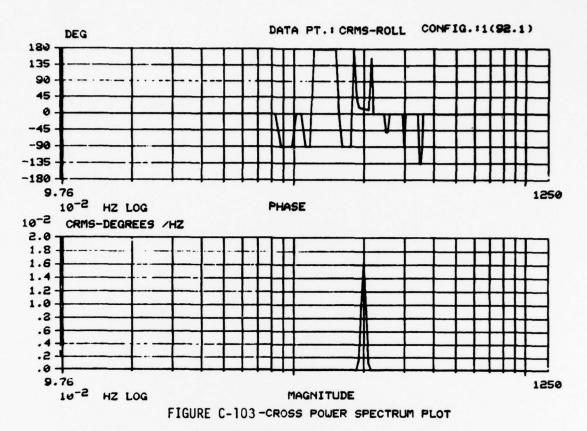












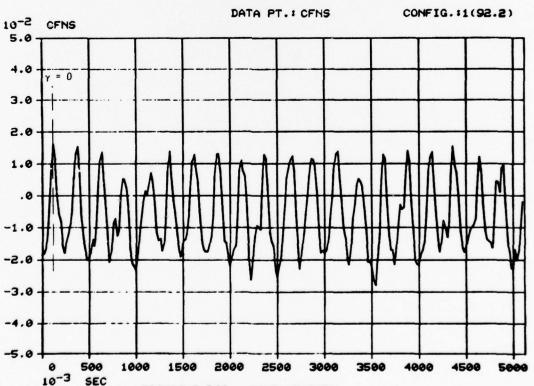
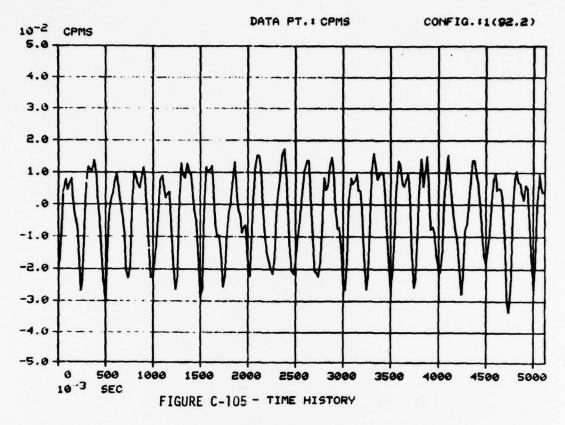
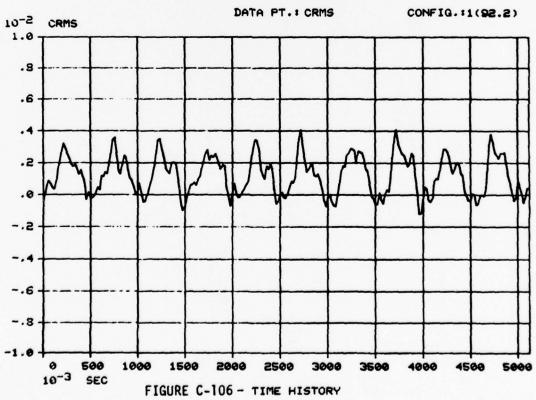
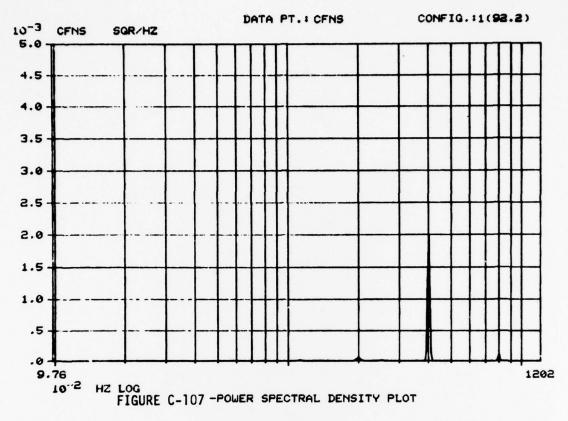
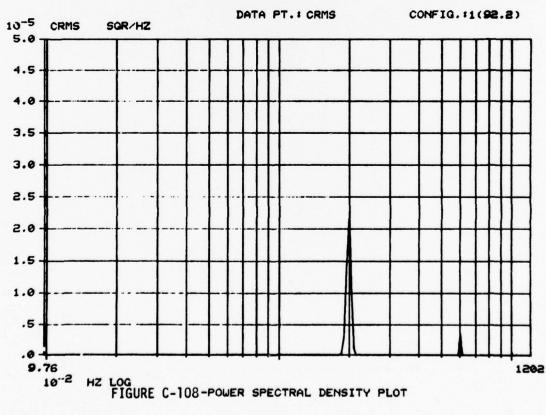


FIGURE C-104 - TIME HISTORY









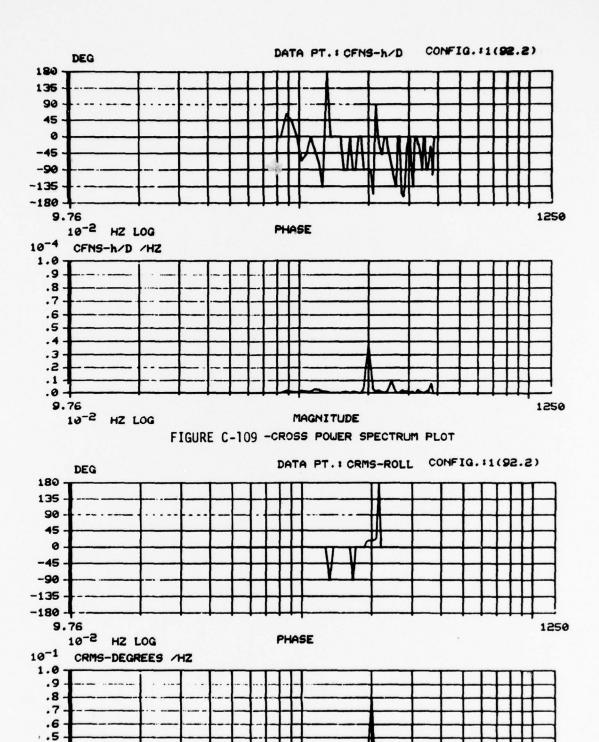


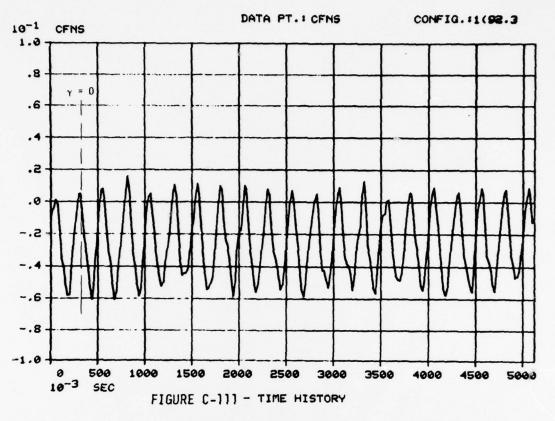
FIGURE C-110 -CROSS POWER SPECTRUM PLOT

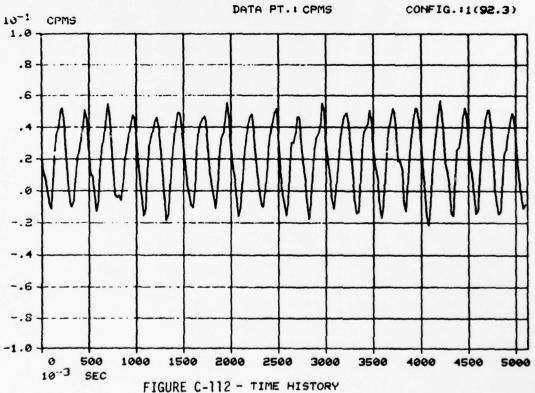
MAGNITUDE

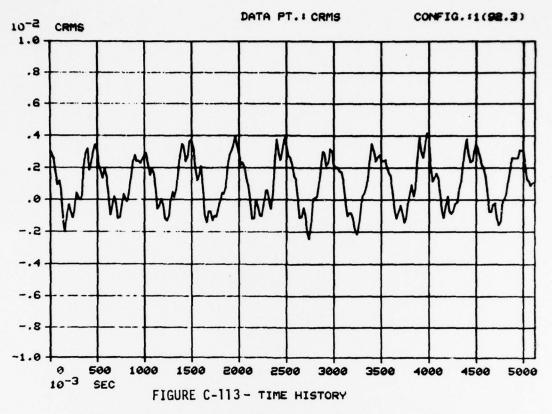
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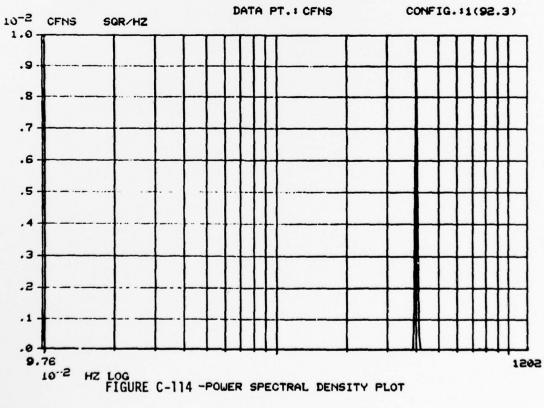
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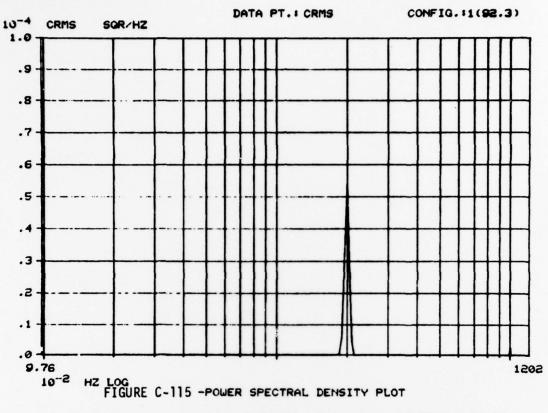
10-5 HZ LOG











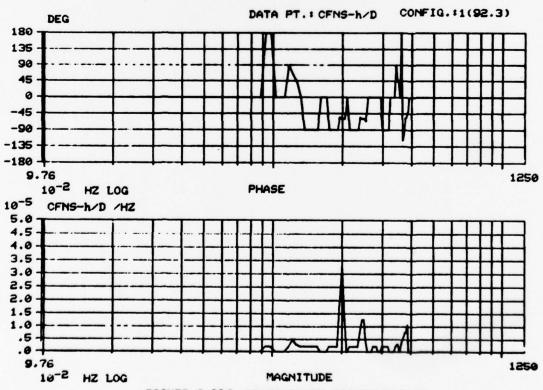
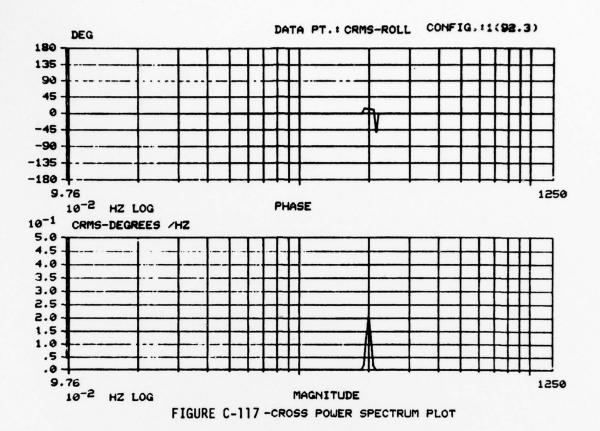
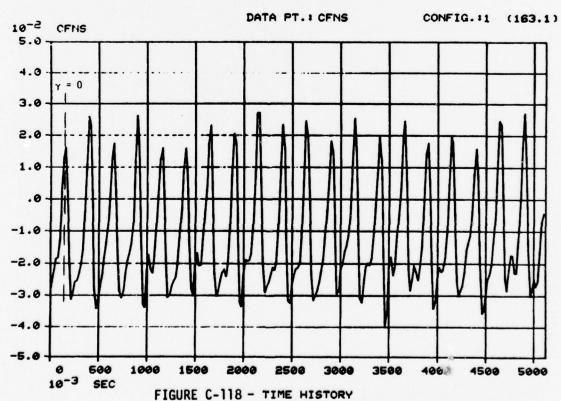
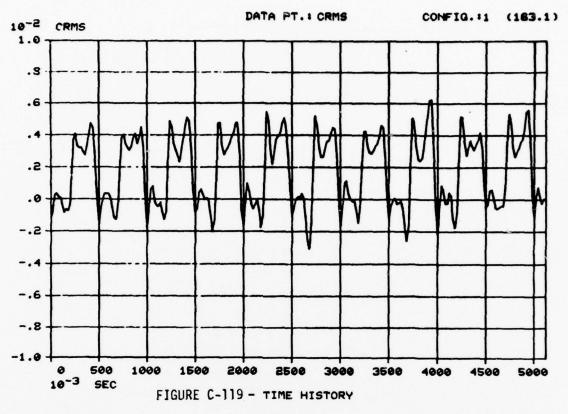
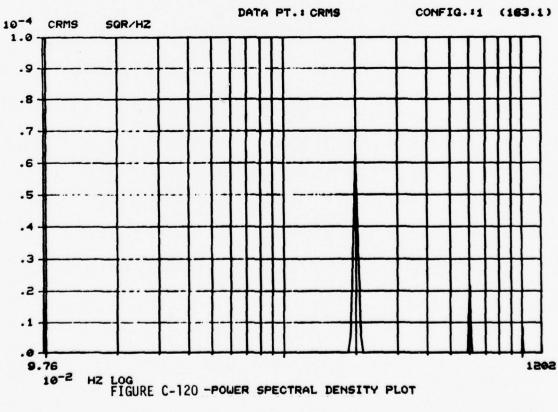


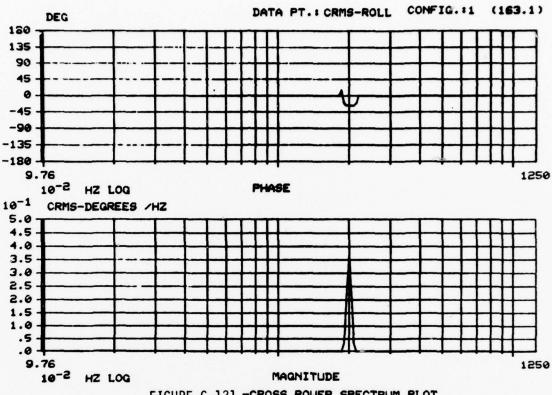
FIGURE C-116 -CROSS POWER SPECTRUM PLOT



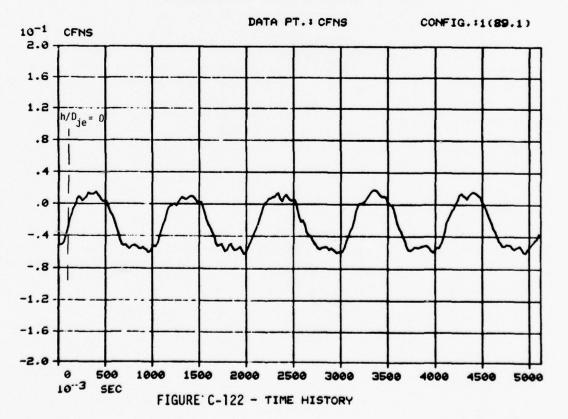


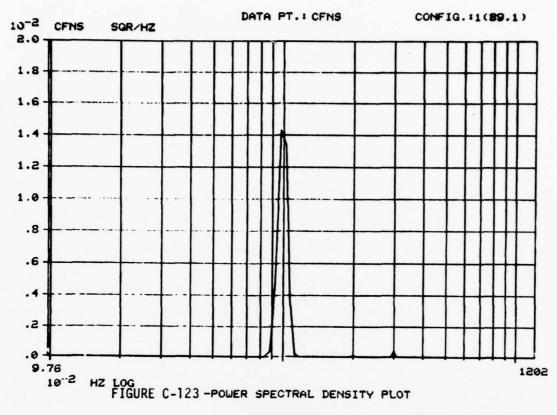












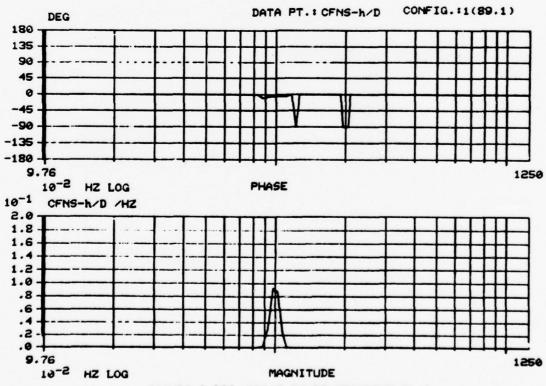
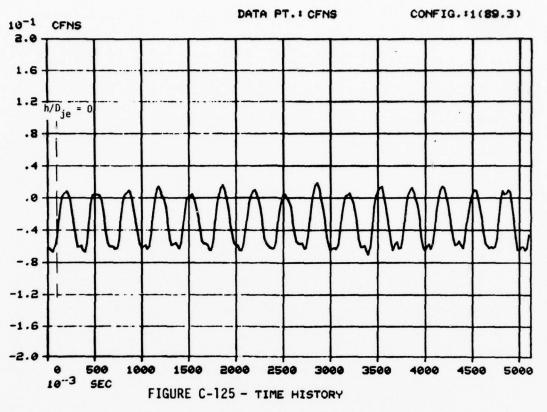
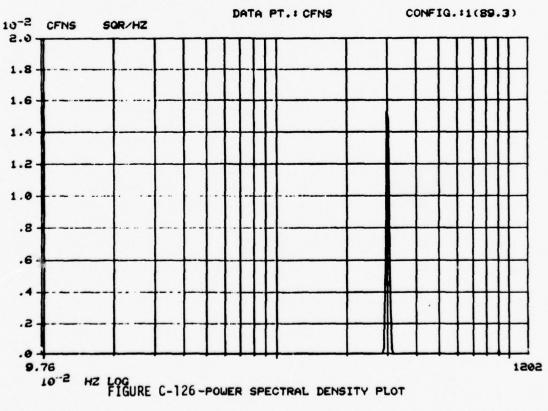
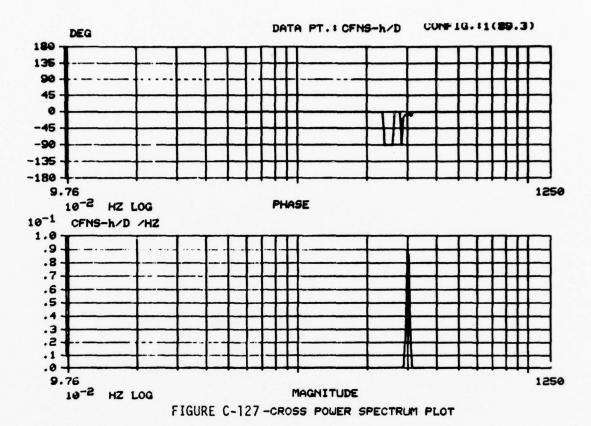
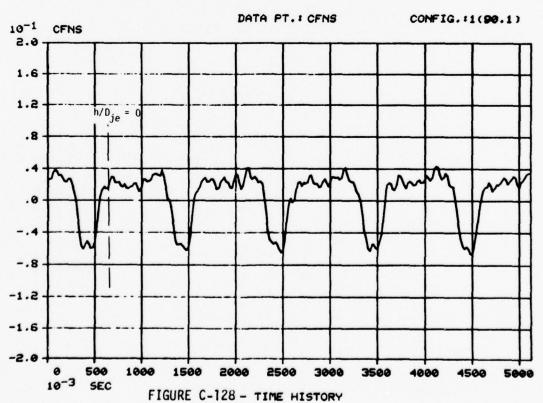


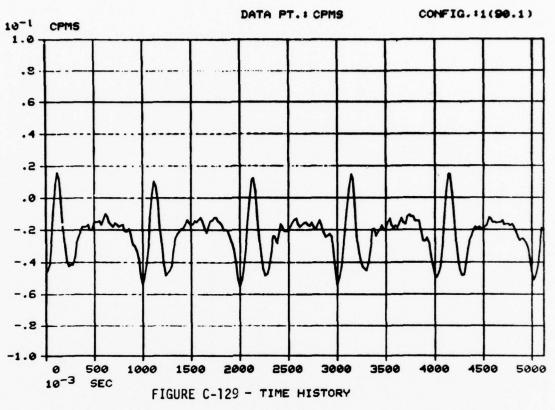
FIGURE C-124 -CROSS POWER SPECTRUM PLOT

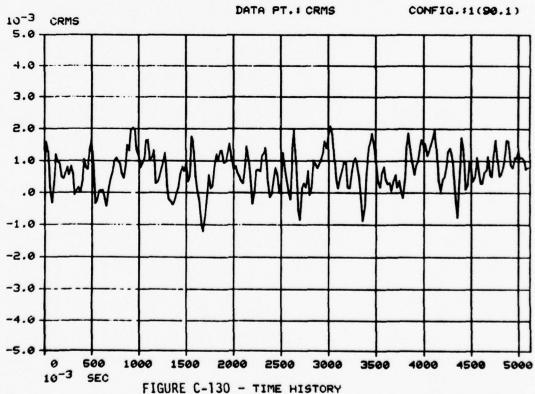


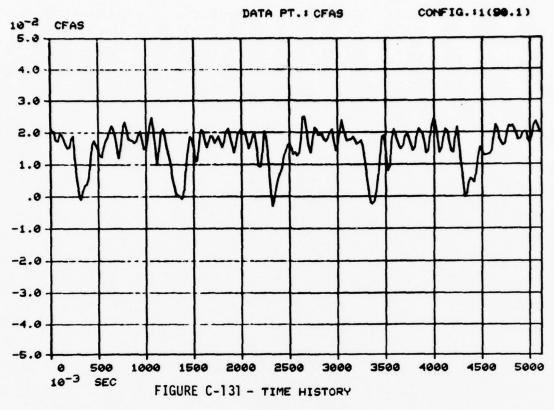


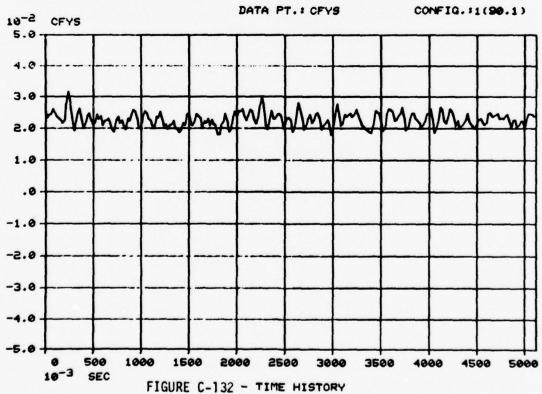


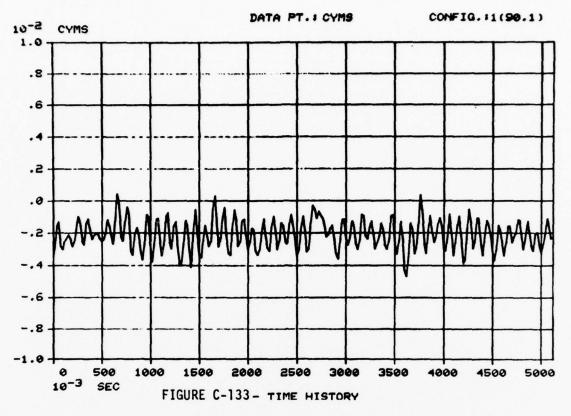


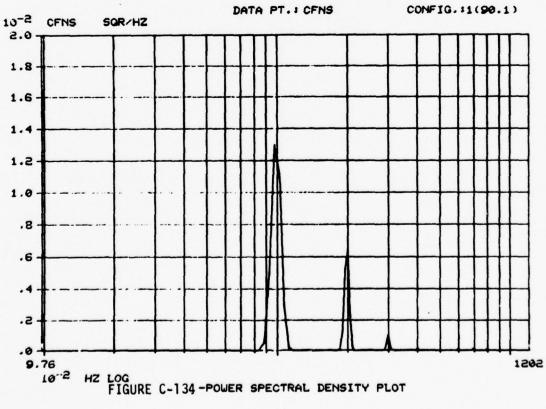


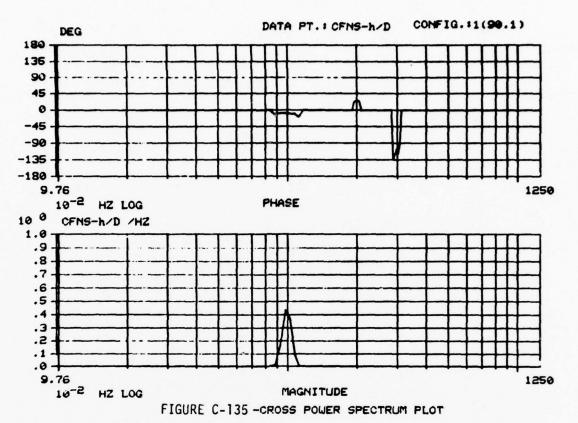


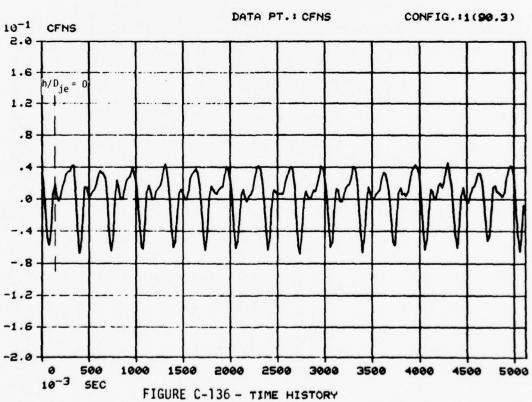


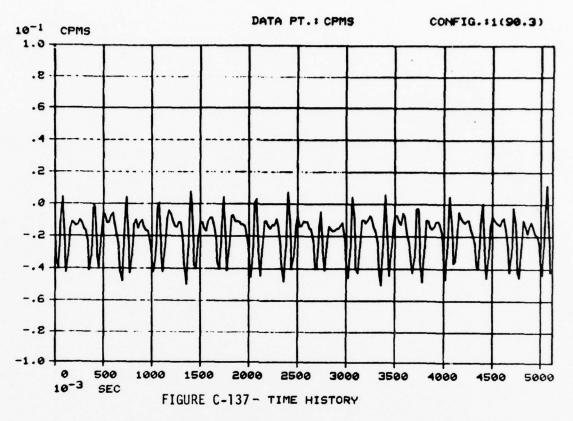


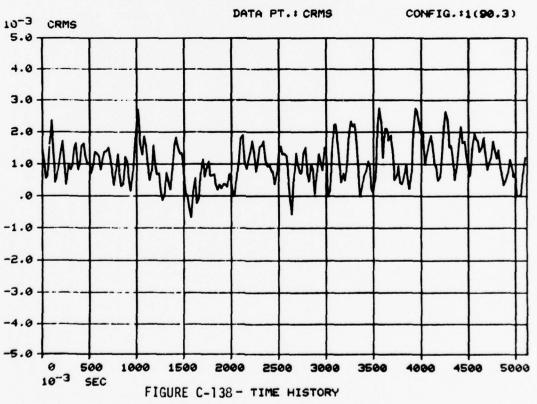


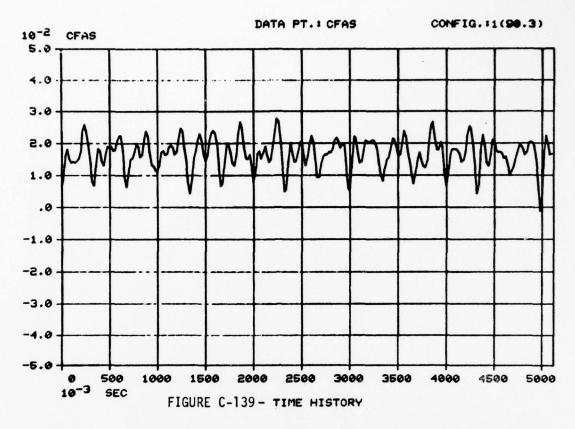


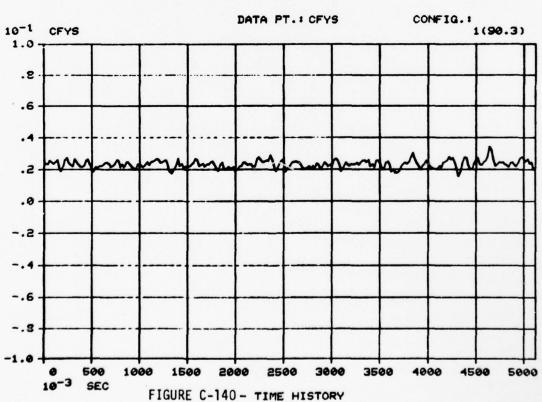


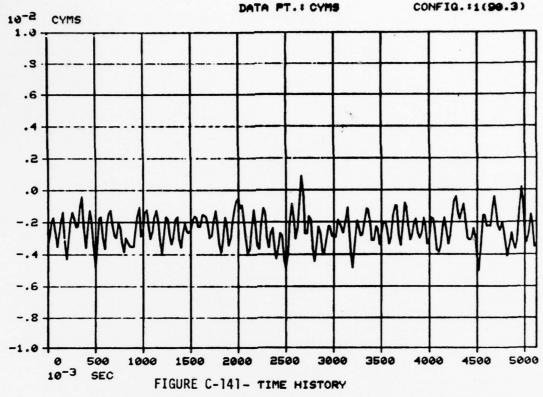


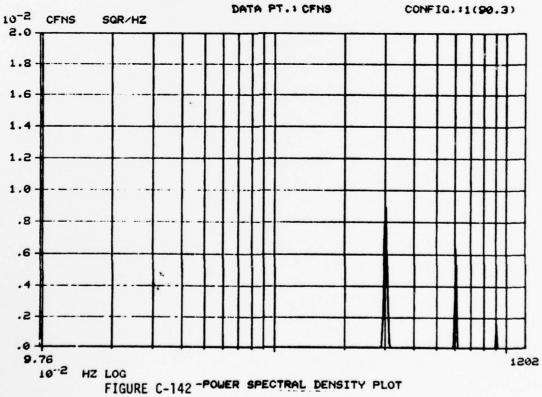


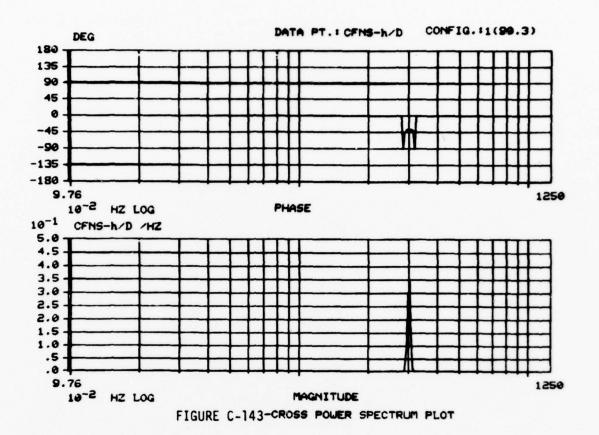


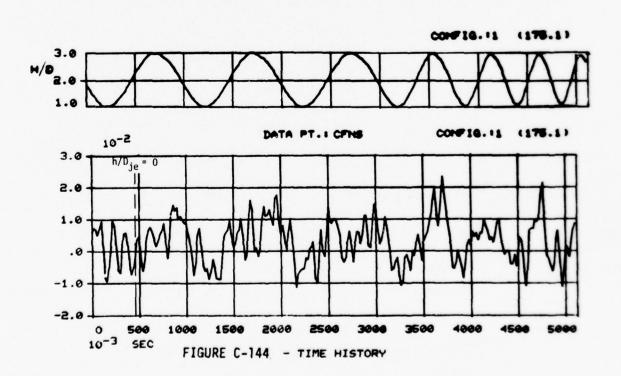


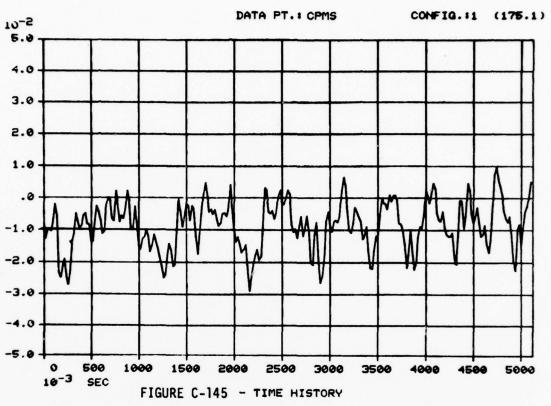


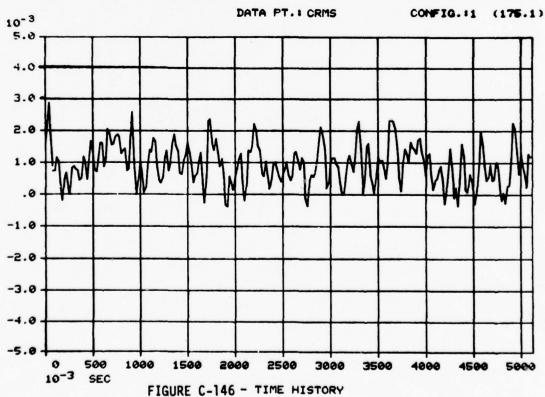


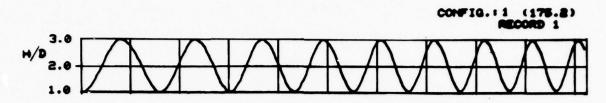


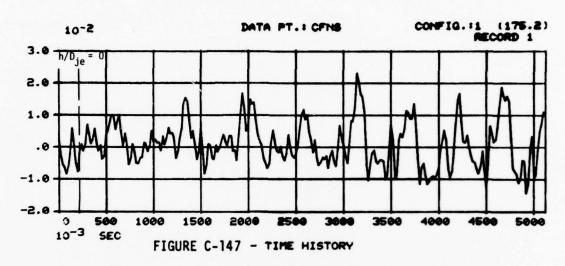


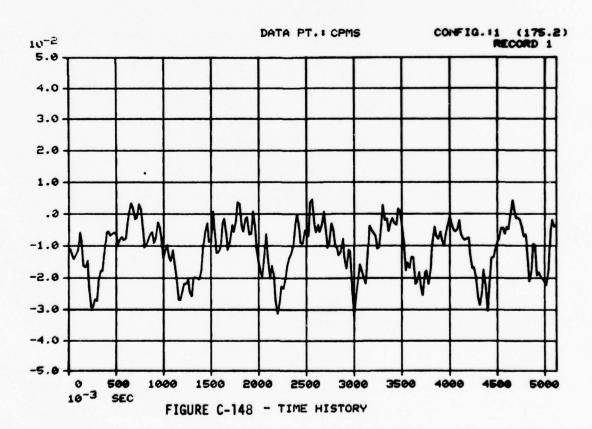


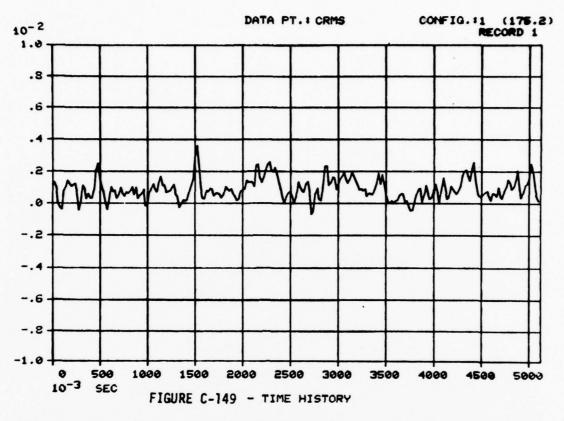


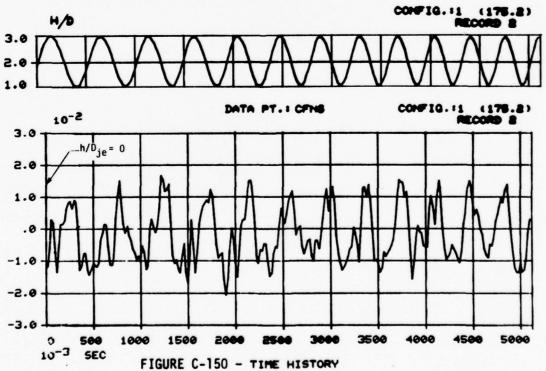


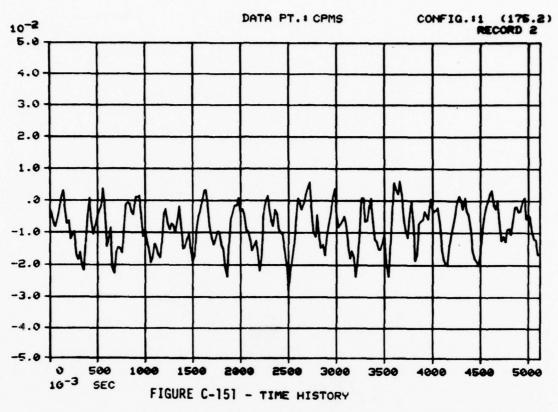


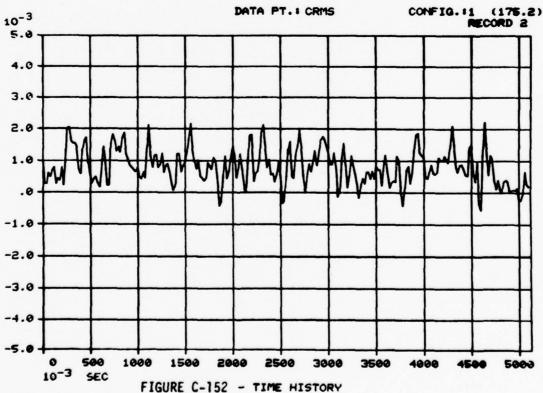


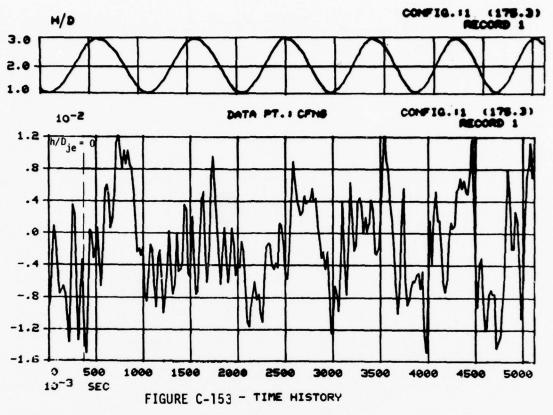


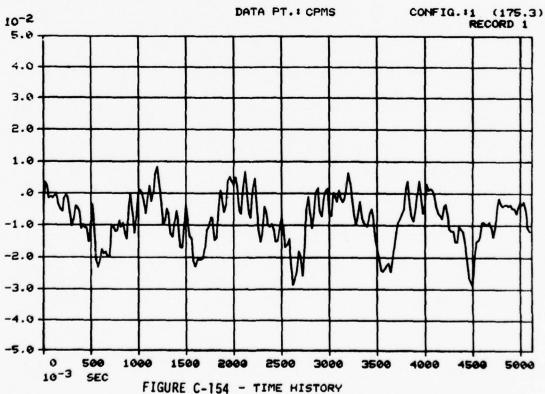


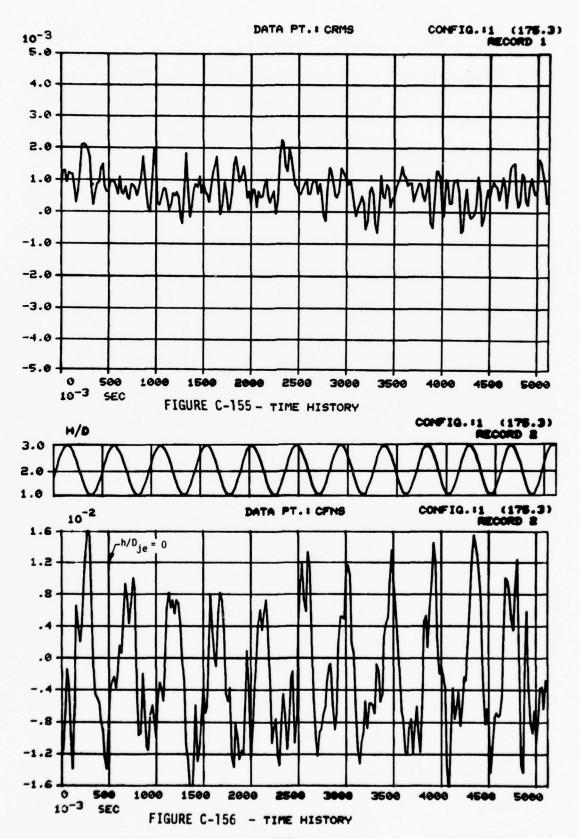


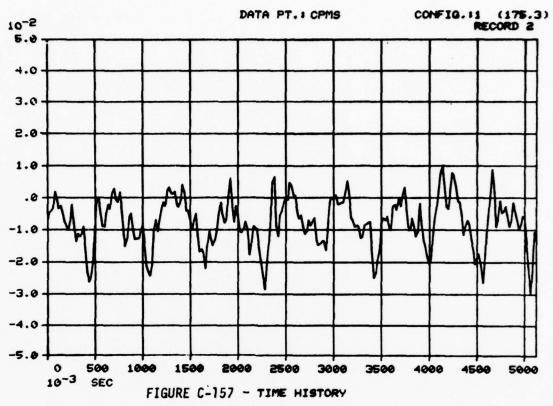


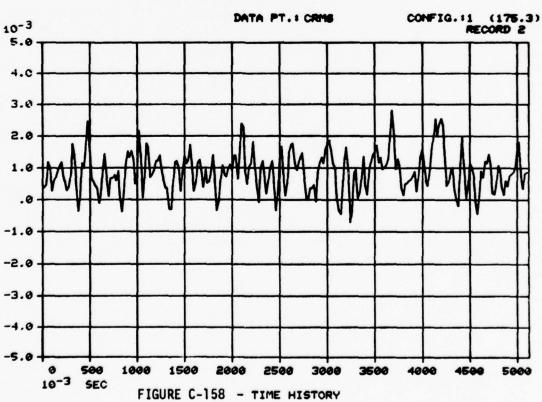


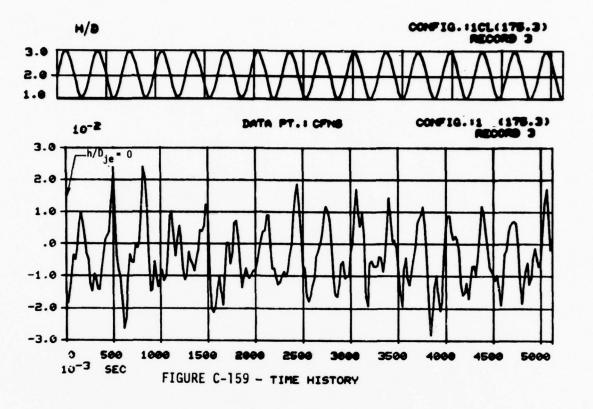


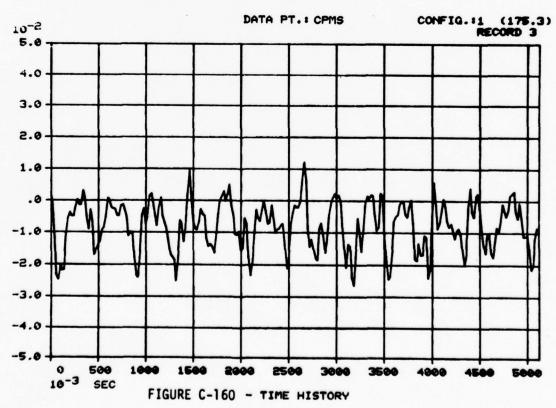


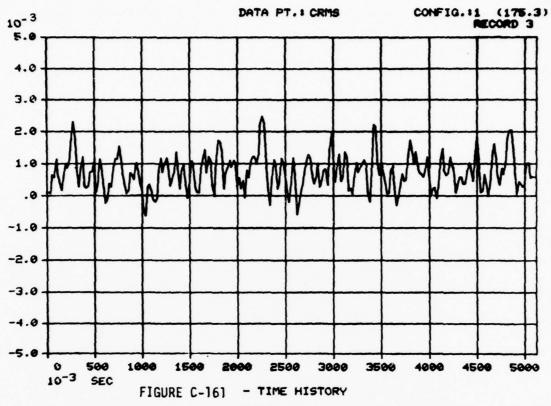


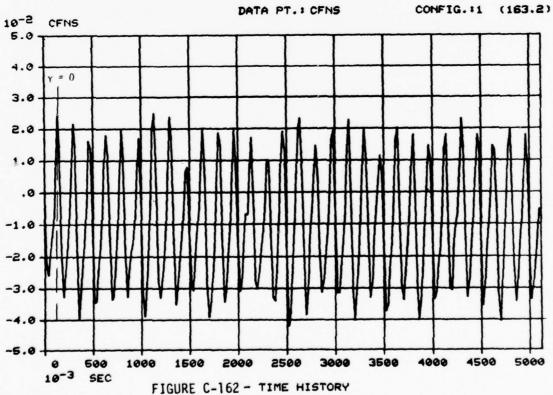


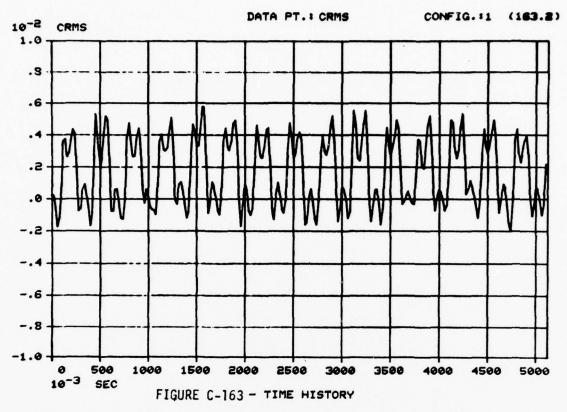


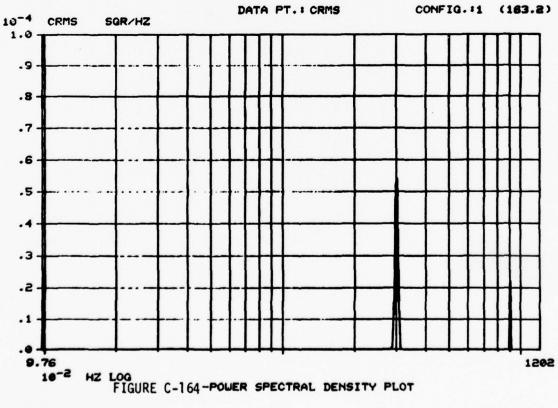


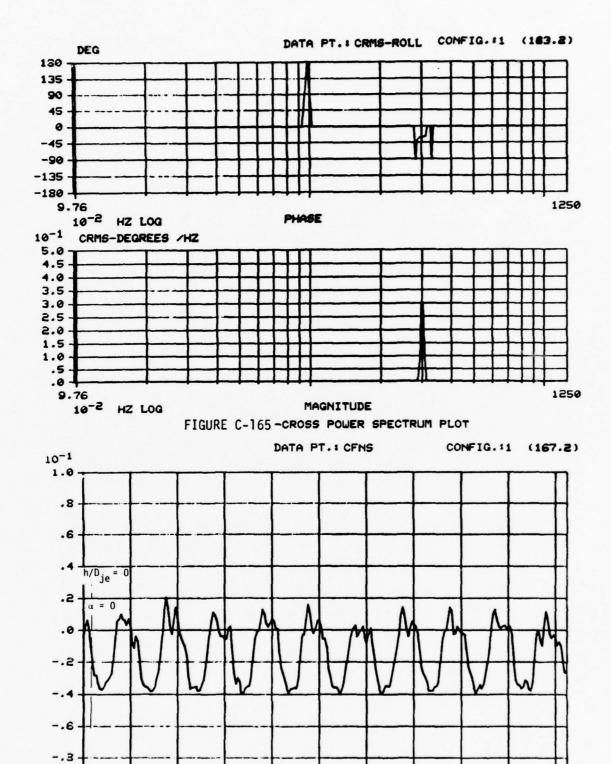










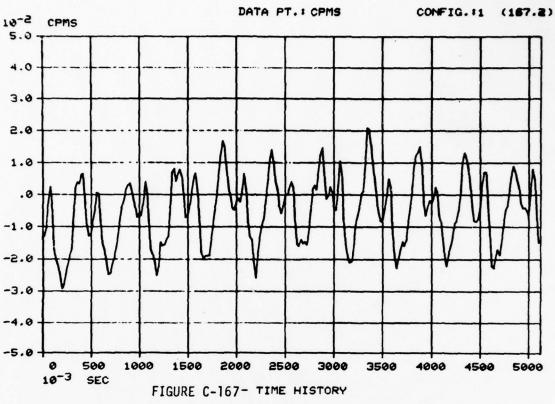


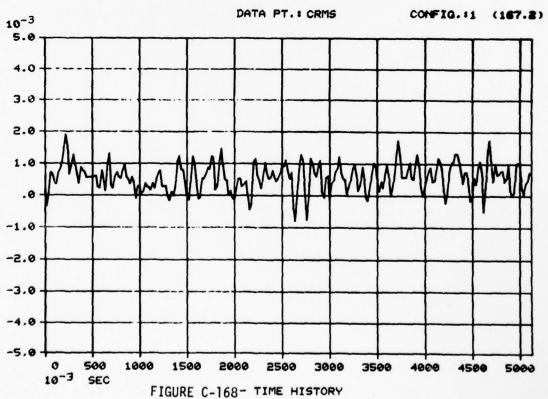
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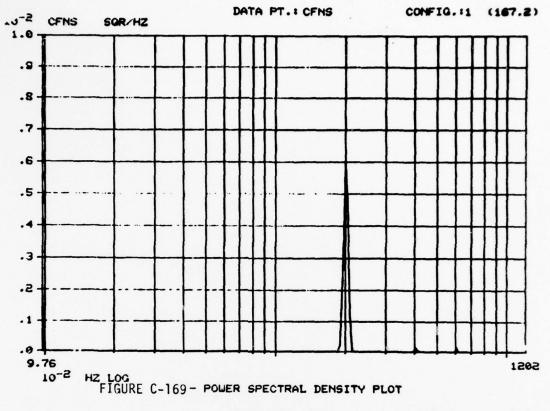
FIGURE C-166- TIME HISTORY

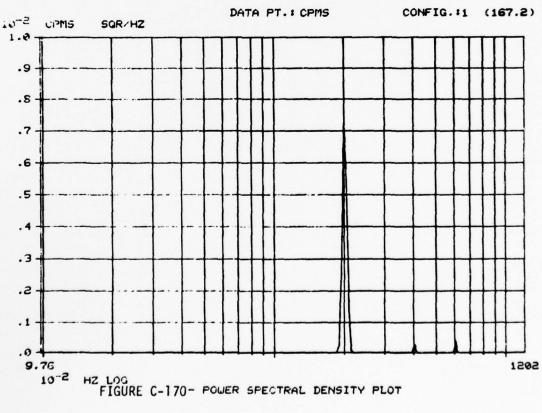
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10-3 SEC









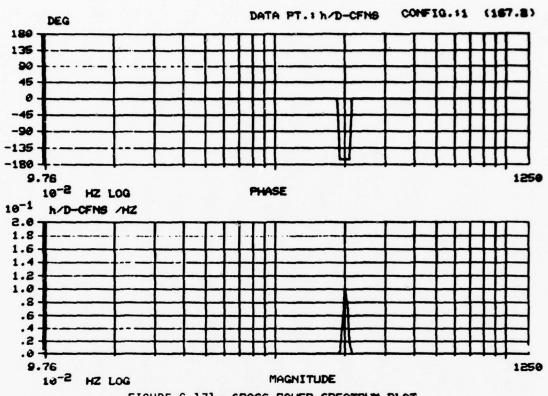


FIGURE C-171 - CROSS POWER SPECTRUM PLOT

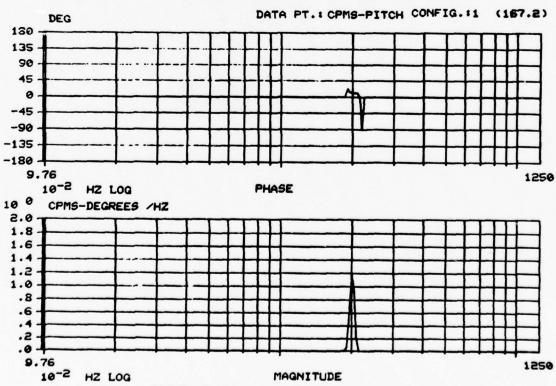
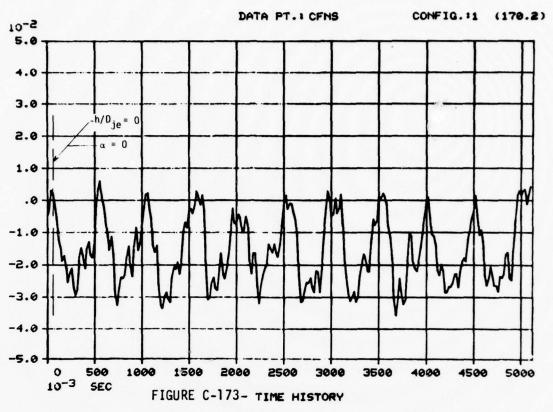
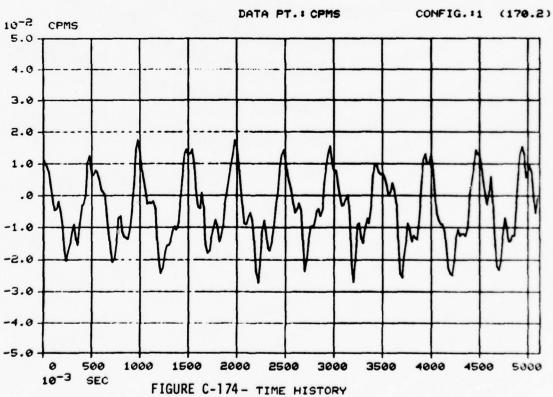
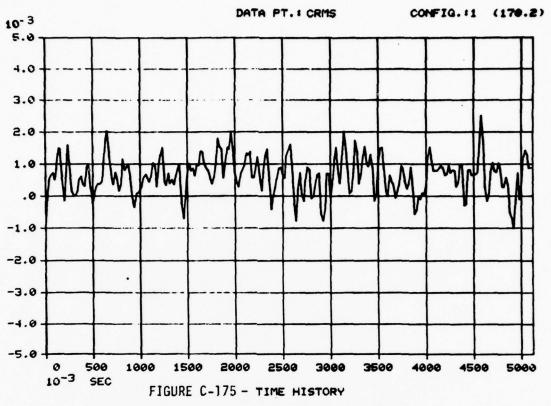
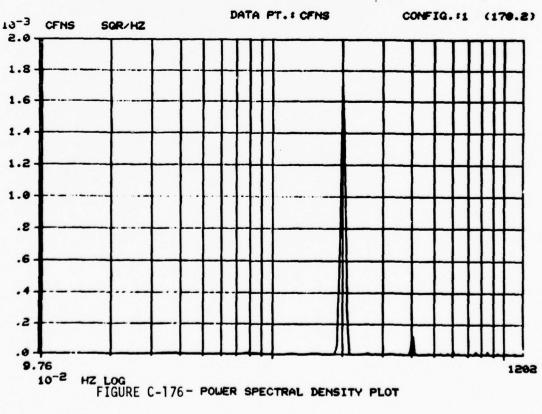


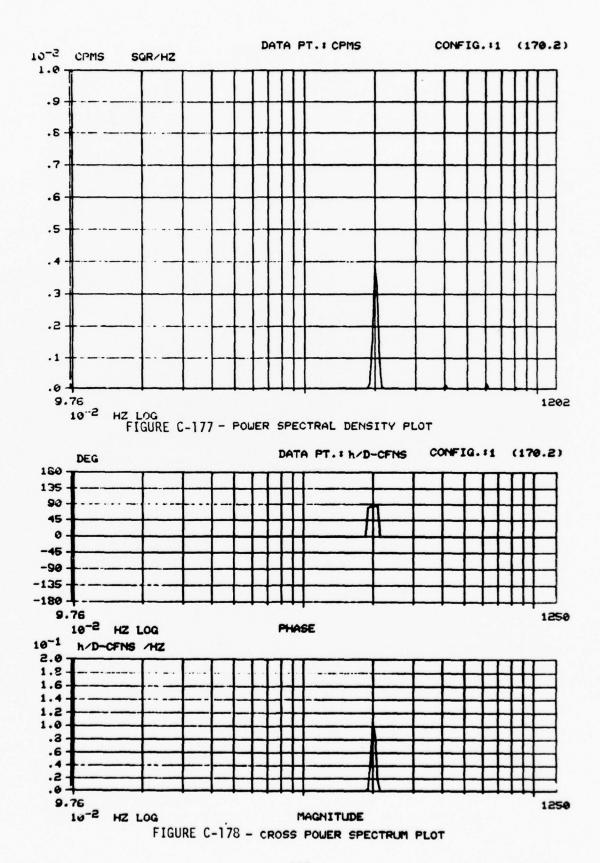
FIGURE C-172 -CROSS POWER SPECTRUM PLOT

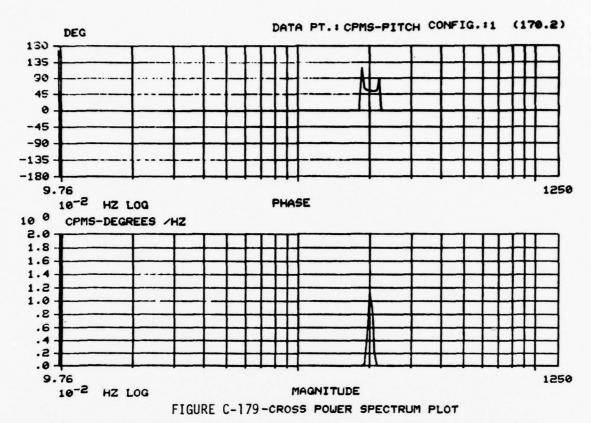


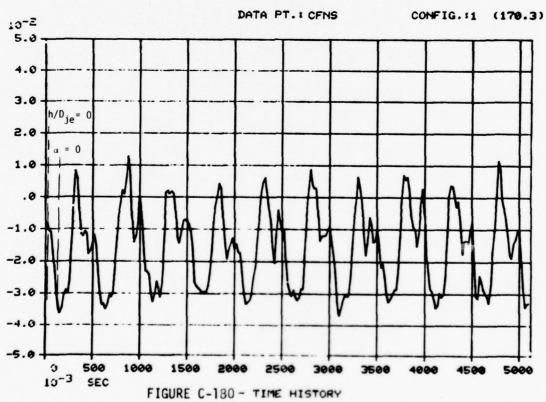


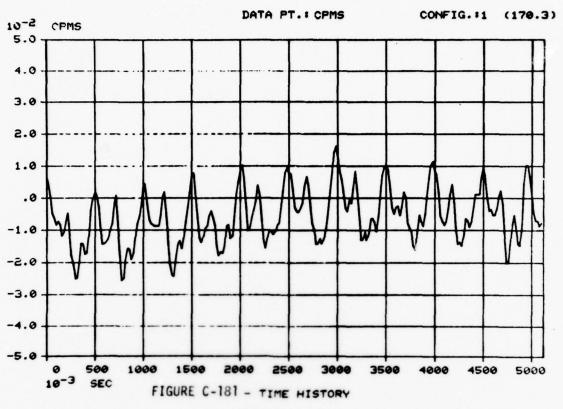


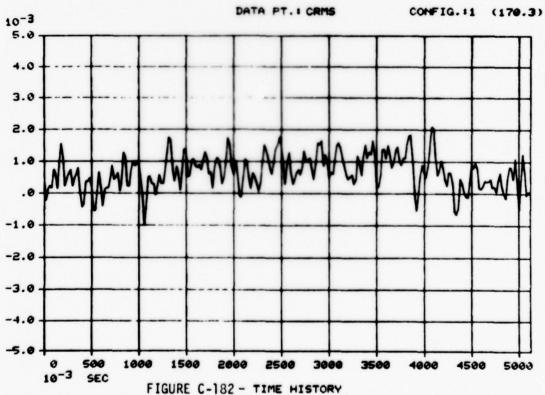


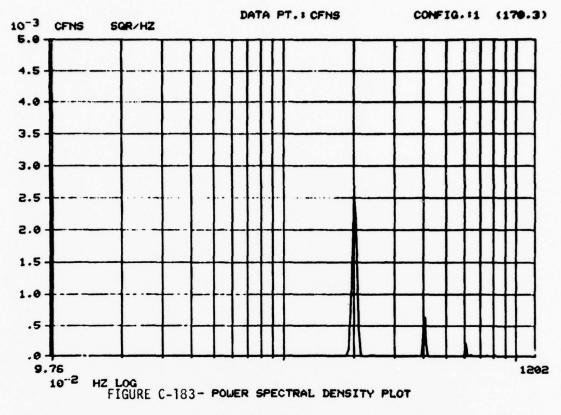


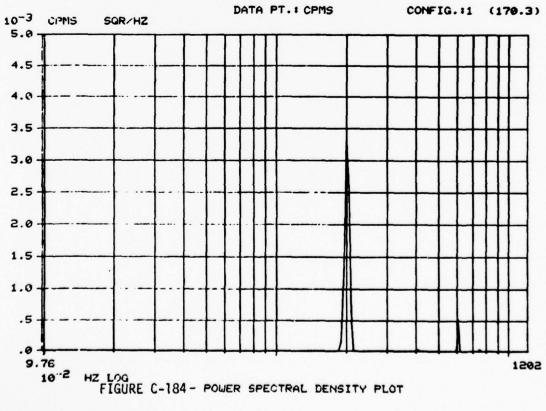


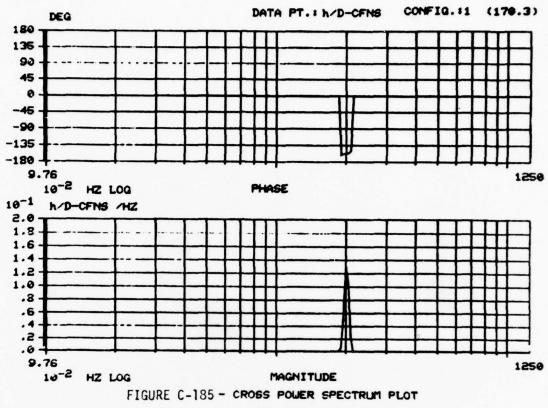












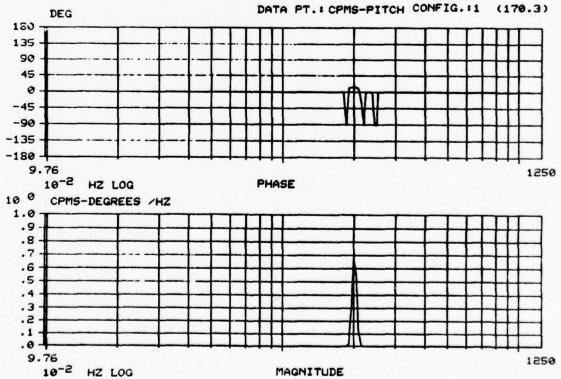
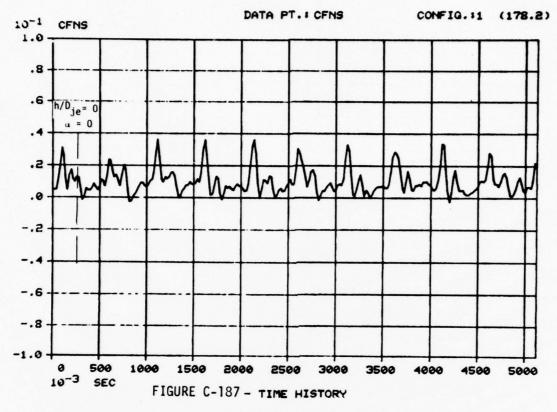
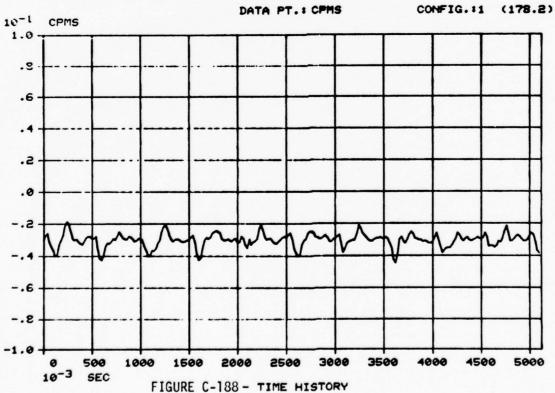
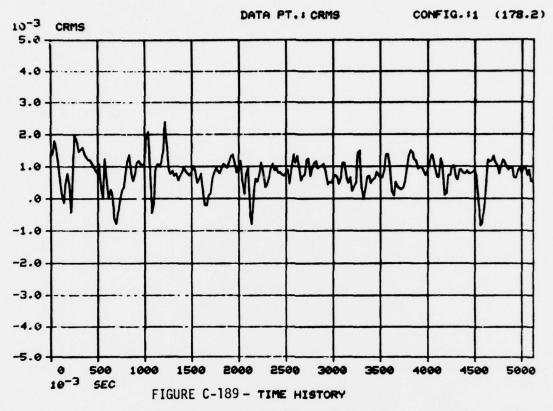
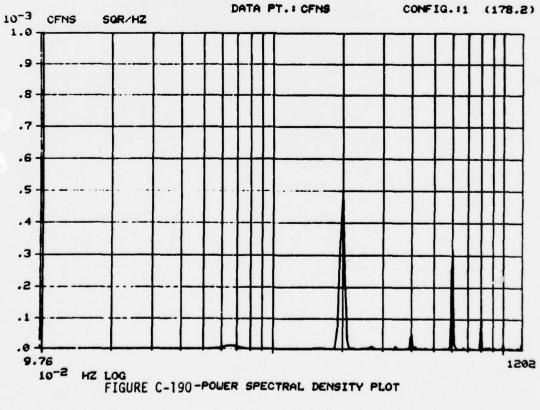


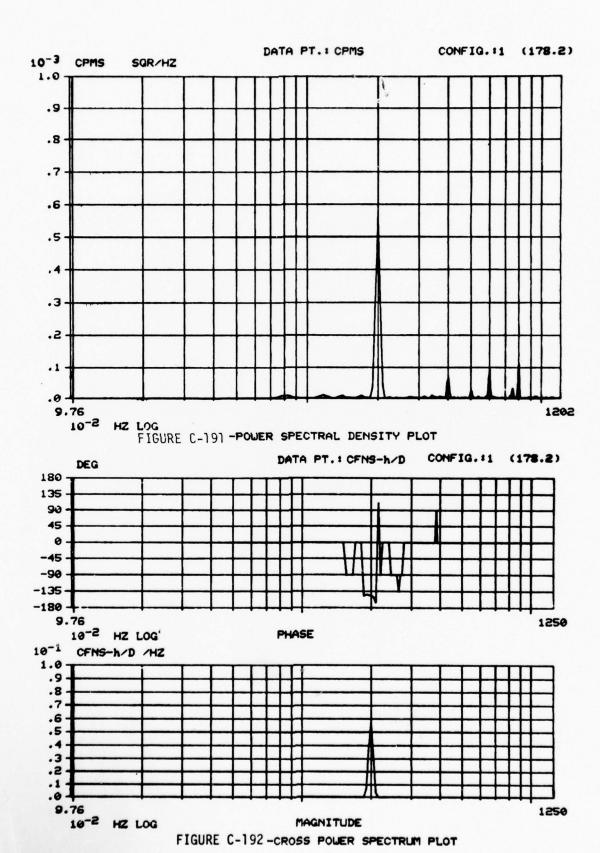
FIGURE C-186-CROSS POWER SPECTRUM PLOT

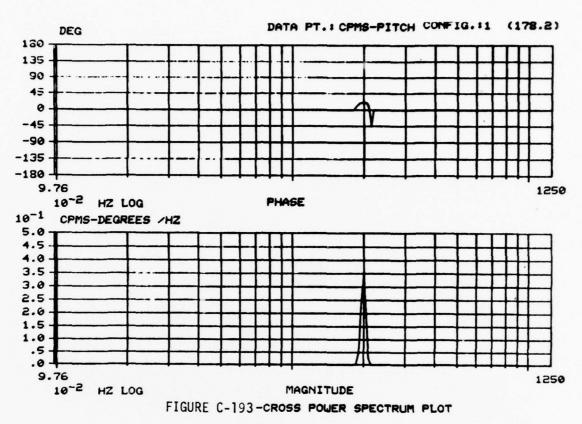


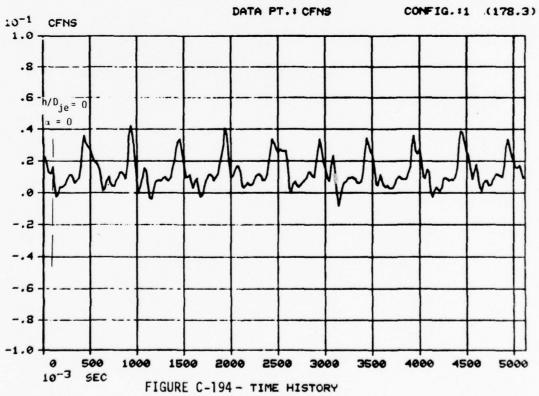


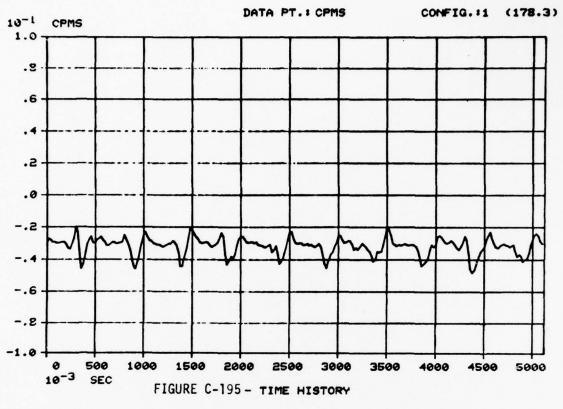


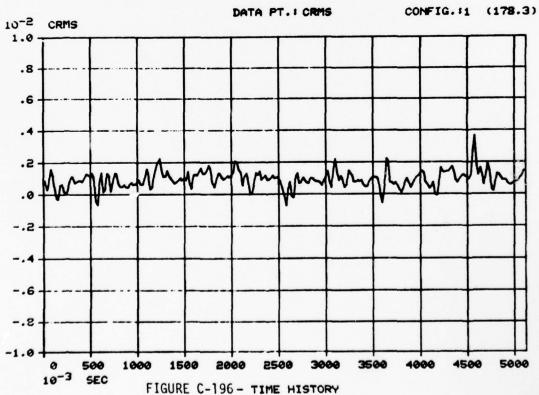


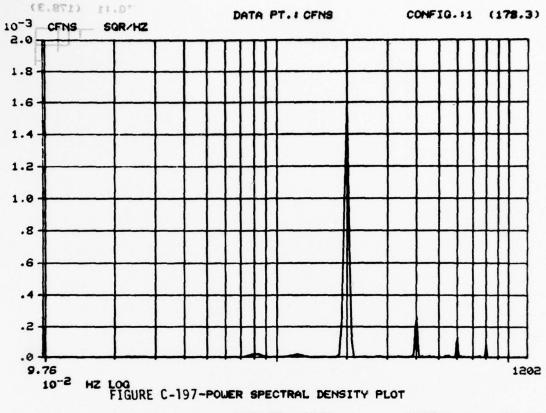


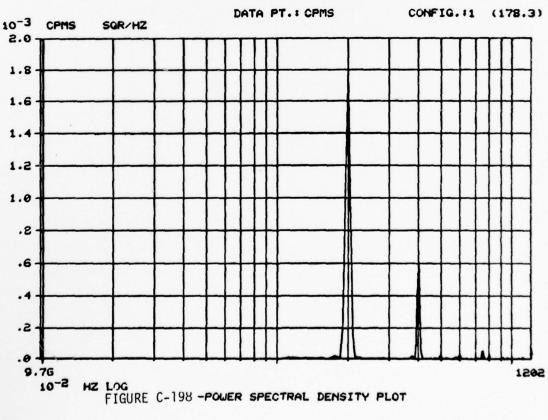


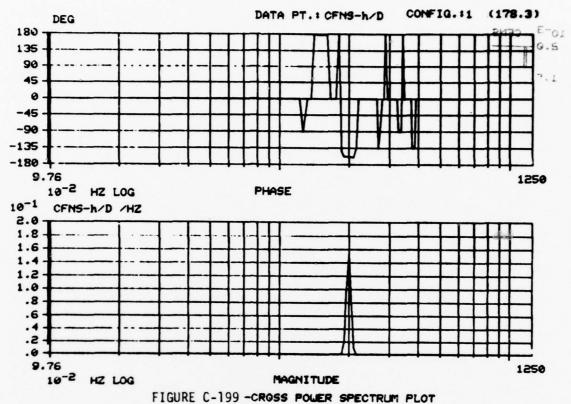






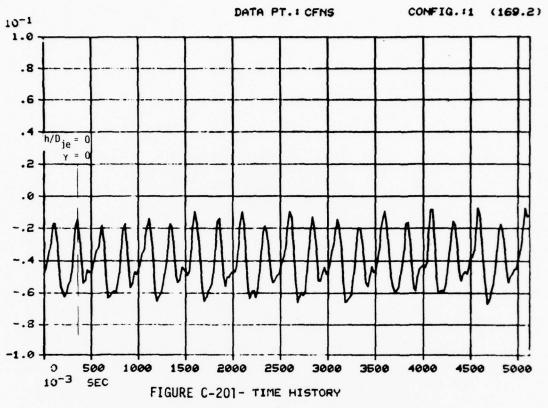


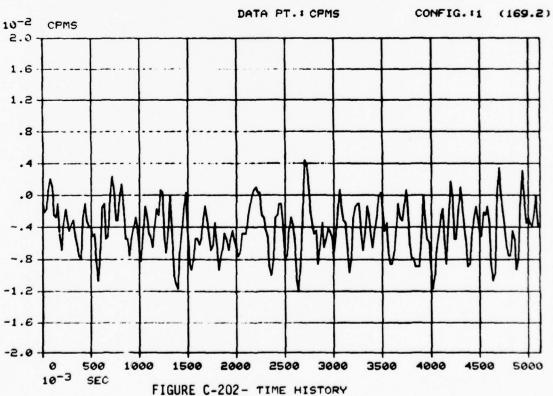


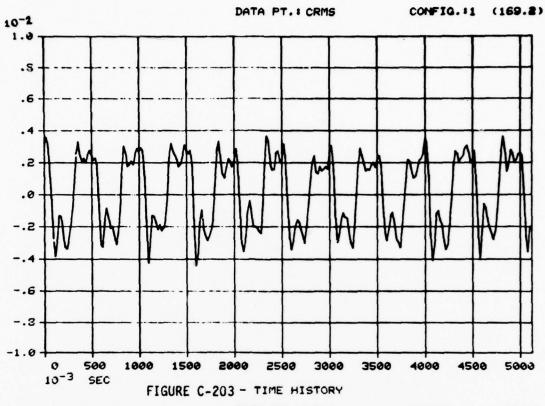


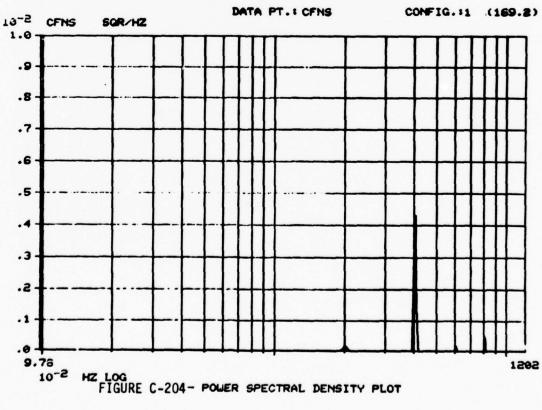
DATA PT.: CPMS-PITCH CONFIG.:1 (178.3) DEG 180 135 90 45 0 -45 -90 -135 -180 -9.76 1250 10-2 HZ LOG PHASE 10 0 CPMS-DEGREES /HZ 1.07 .9 -.8 -.7 -.6 .5 -.4 -.3 -.2. .1 .0 -9.76 1250 10-2 HZ LOG MAGNITUDE

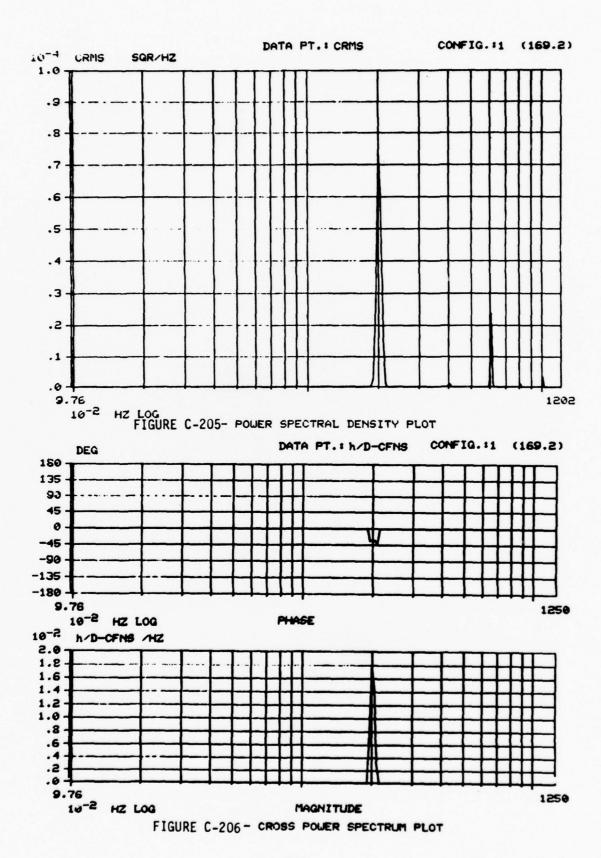
FIGURE C-200 -cross power spectrum PLOT

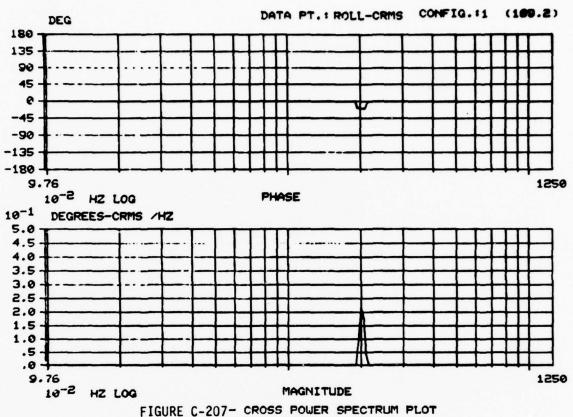






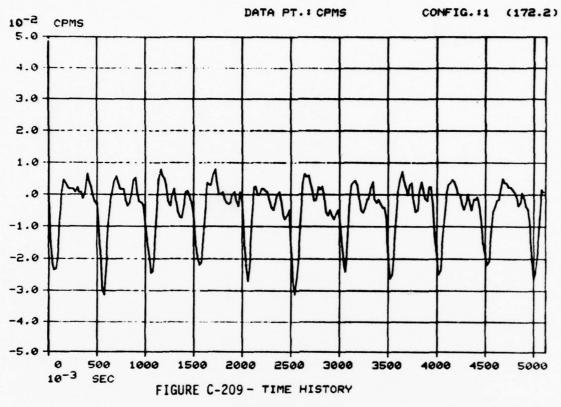


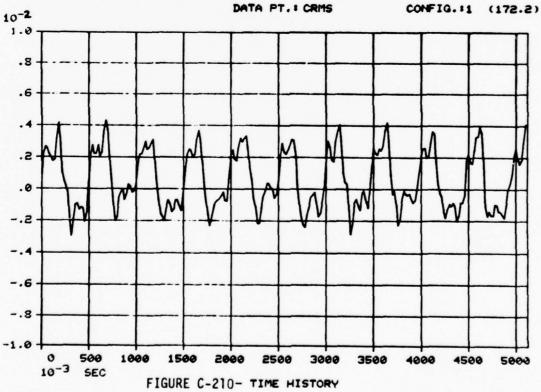


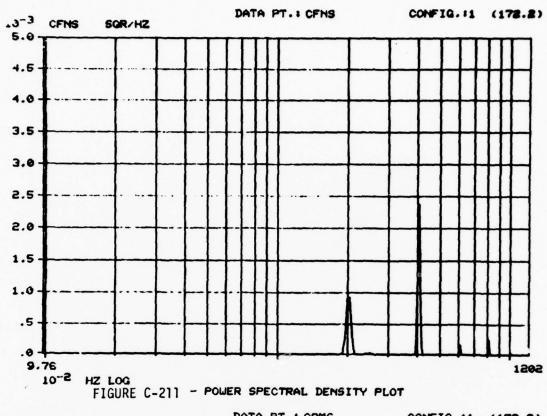


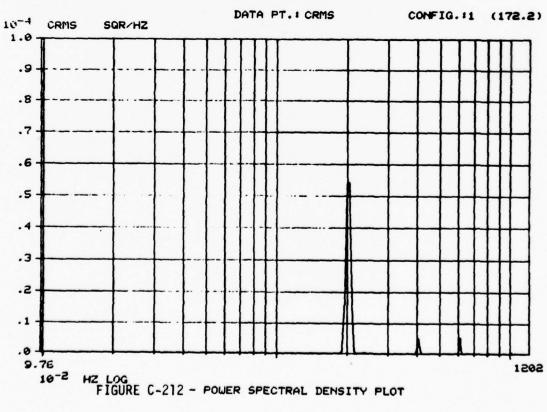
DATA PT.: CFNS CONFIG. :1 (172.2) 10-1 1.0 .8 .6 s.  $h/D_{je} = 0$  $\gamma = 0$ .0 -.2 -.3 -1.0 -0 500 2500 2000 3000 3600 4000 4500 5000 10..3 SEC

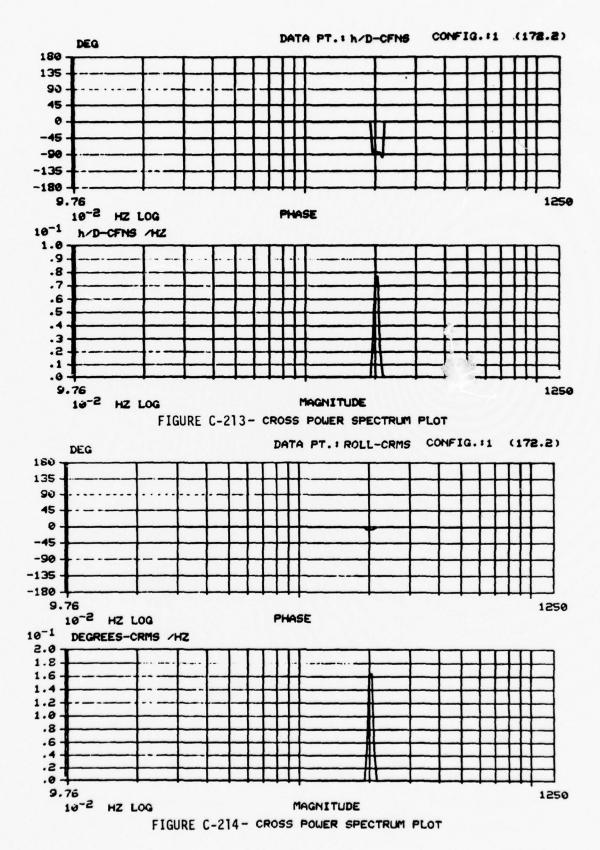
FIGURE C-208 - TIME HISTORY

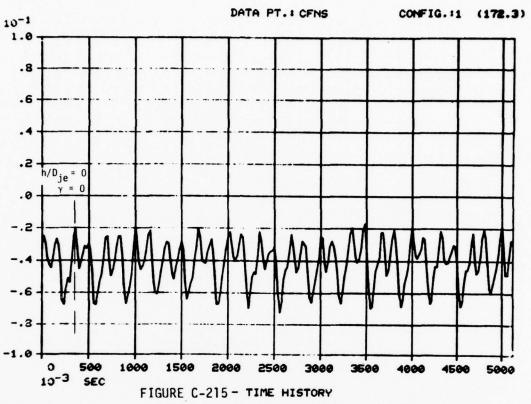


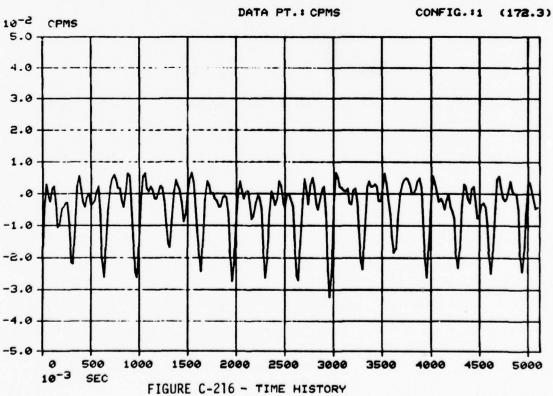


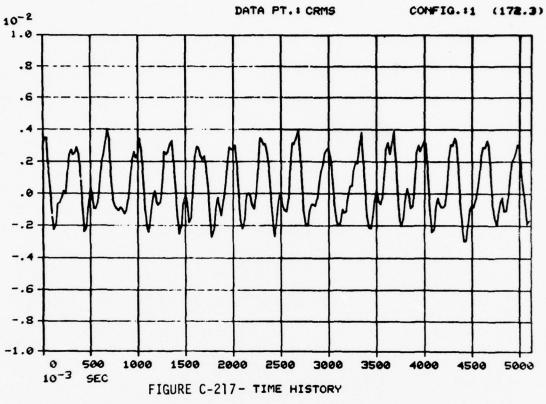


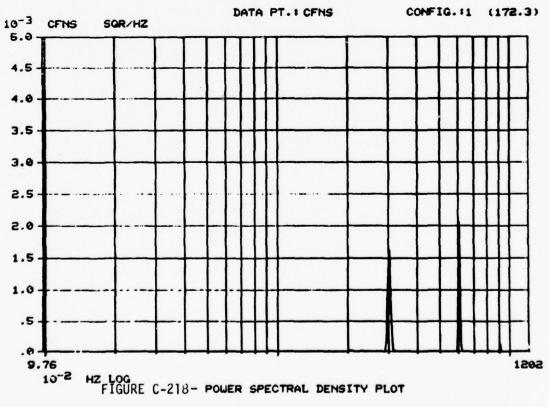


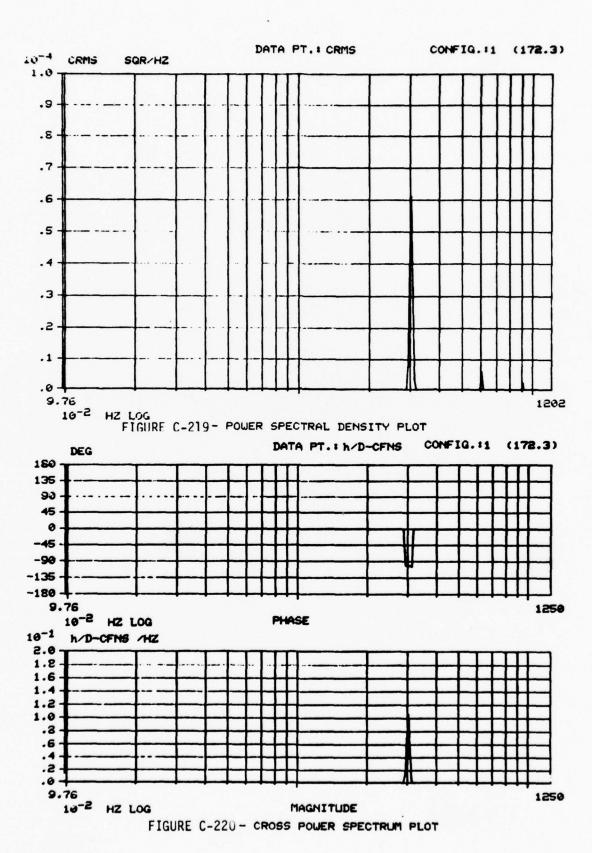












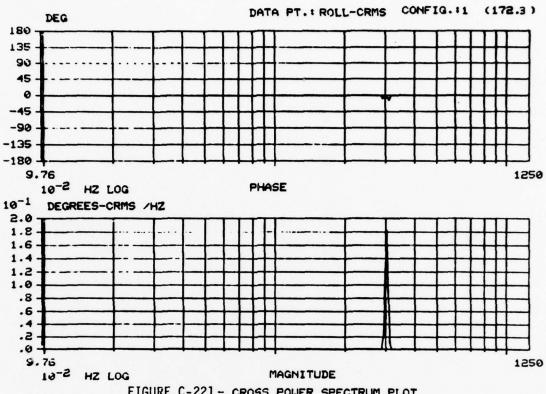
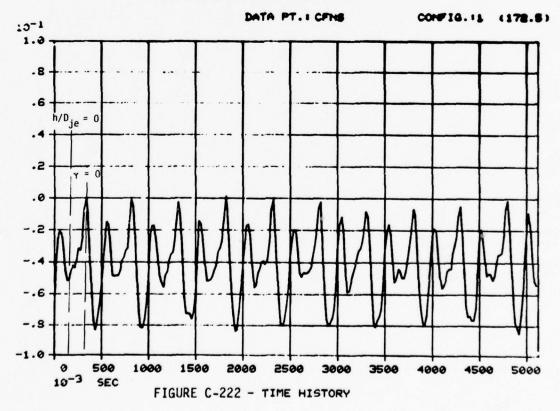
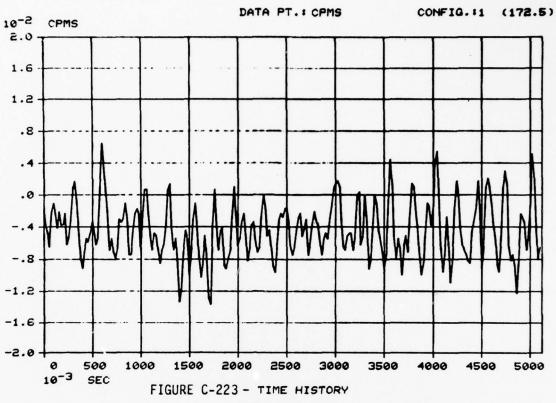
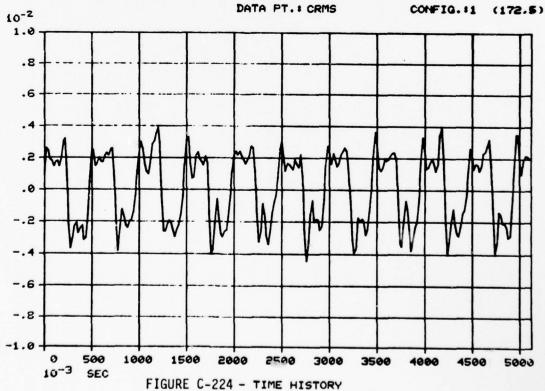
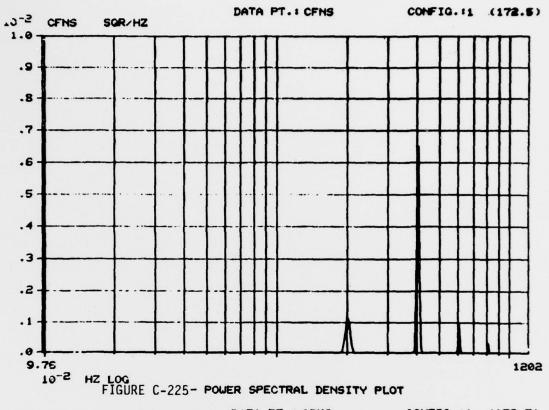


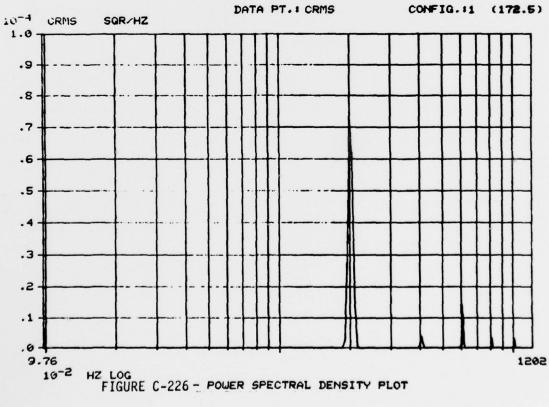
FIGURE C-221 - CROSS POWER SPECTRUM PLOT











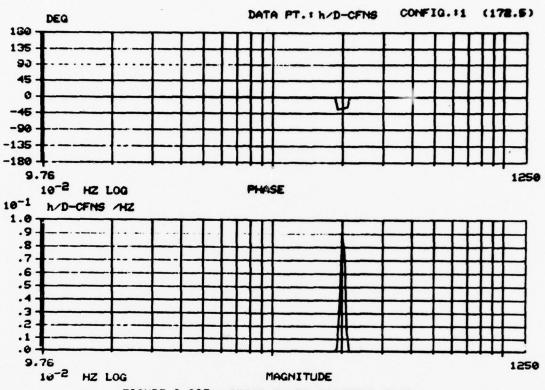


FIGURE C-227 - CROSS POWER SPECTRUM PLOT

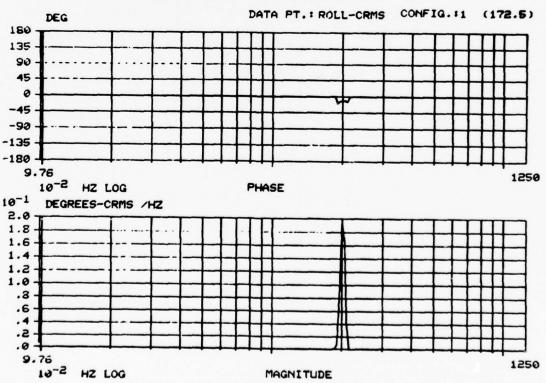
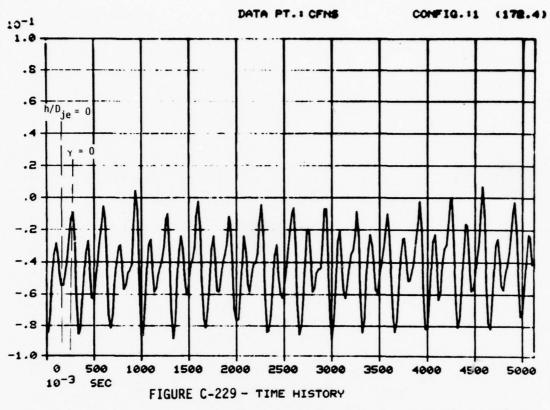
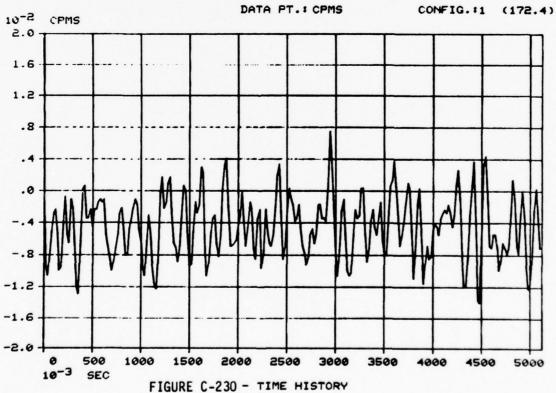
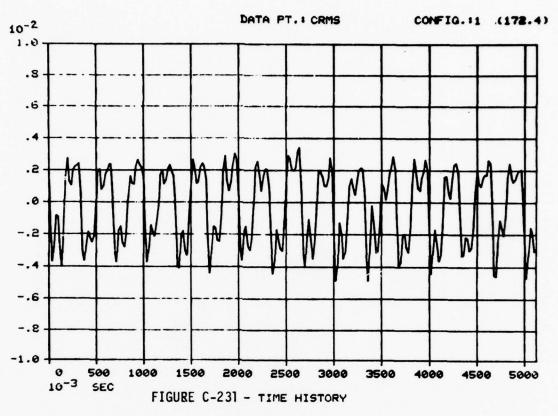
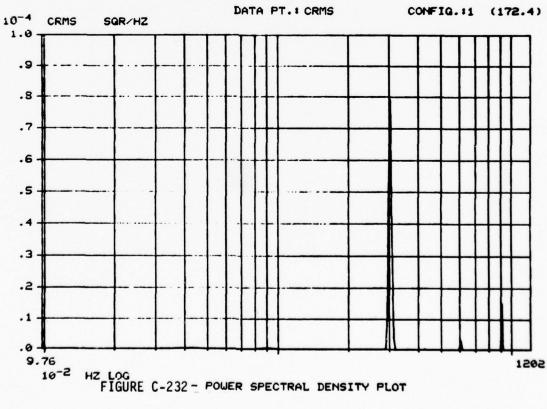


FIGURE C-228 - CROSS POWER SPECTRUM PLOT









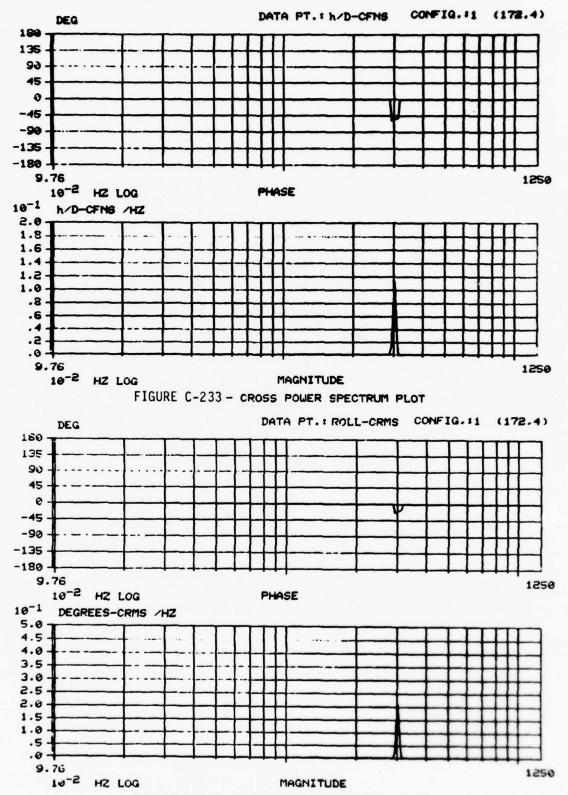
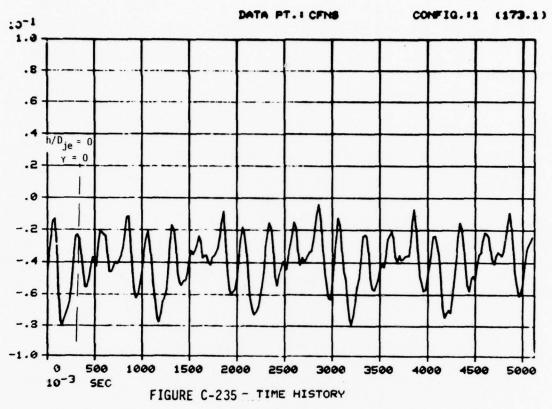
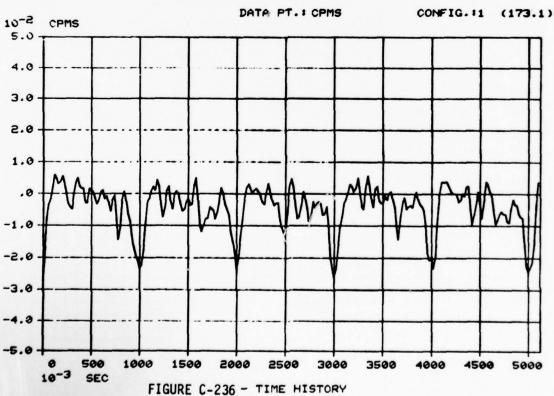
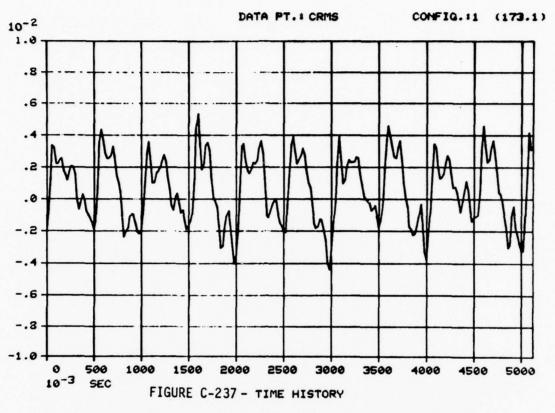
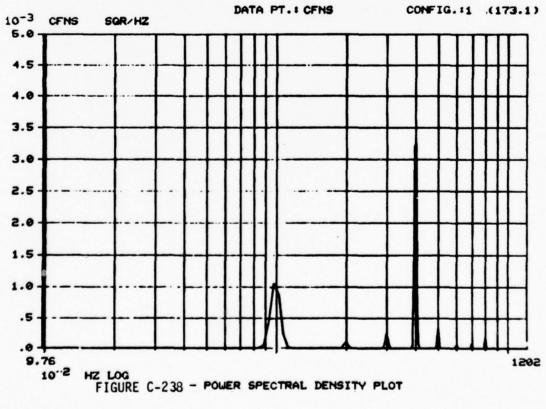


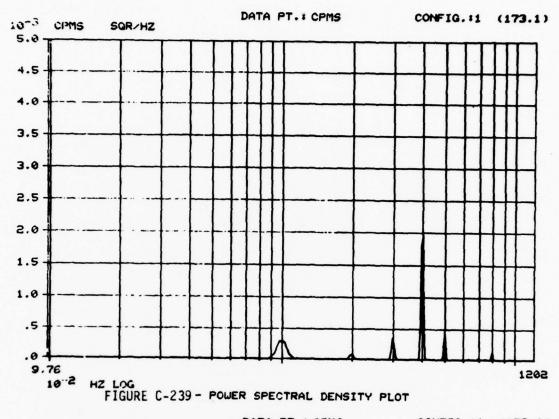
FIGURE C-234 - CROSS POWER SPECTRUM PLOT

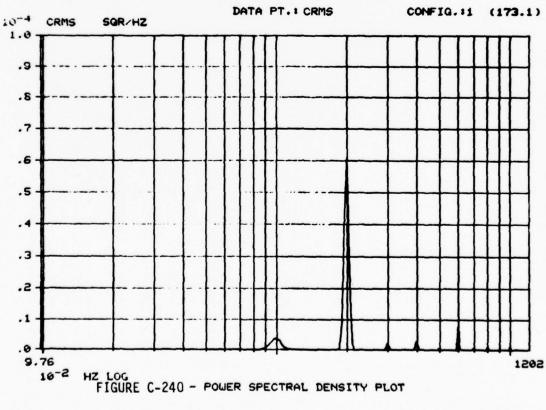












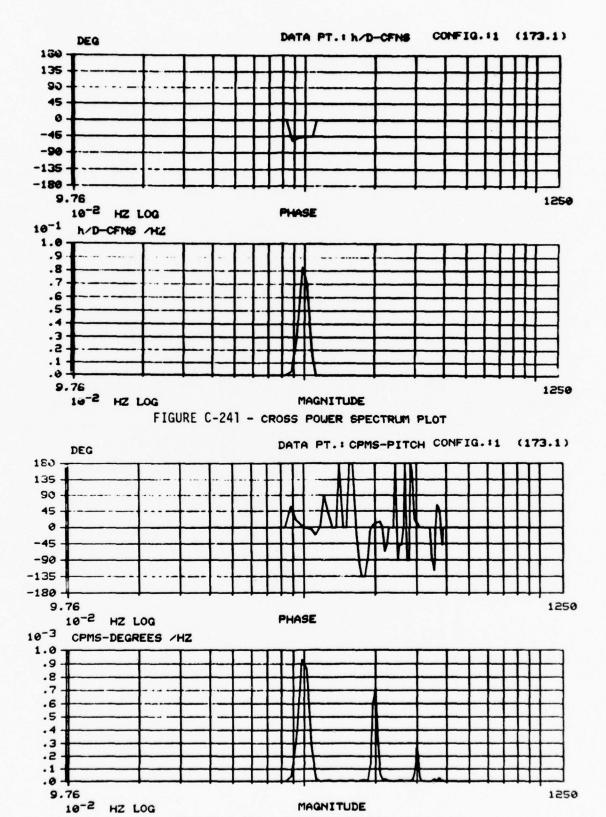
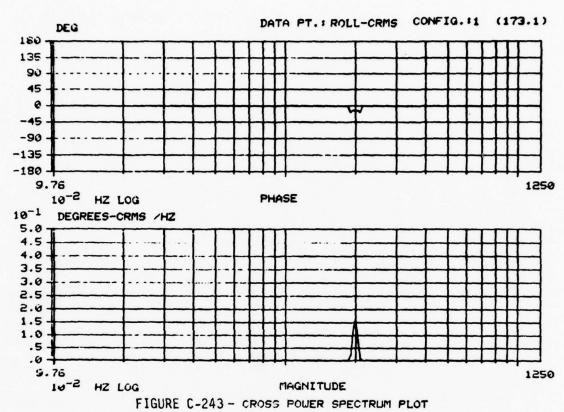
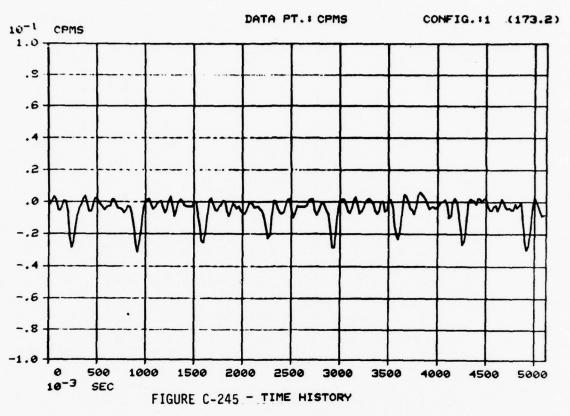
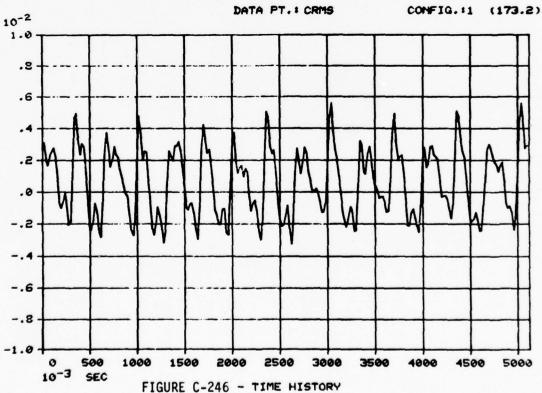


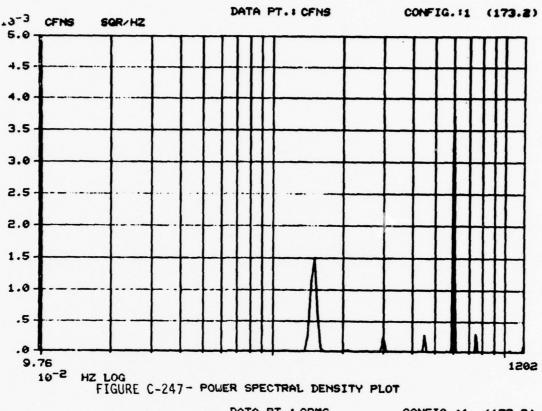
FIGURE C-242 -CROSS POWER SPECTRUM PLOT

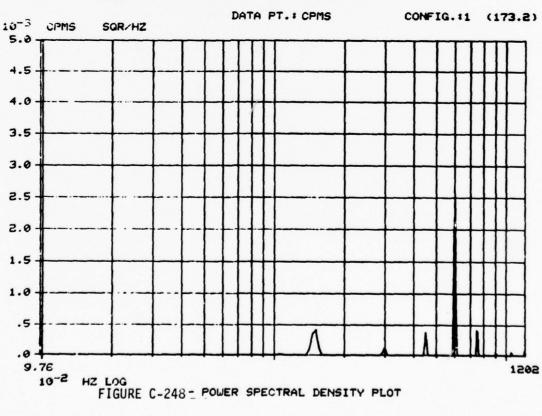


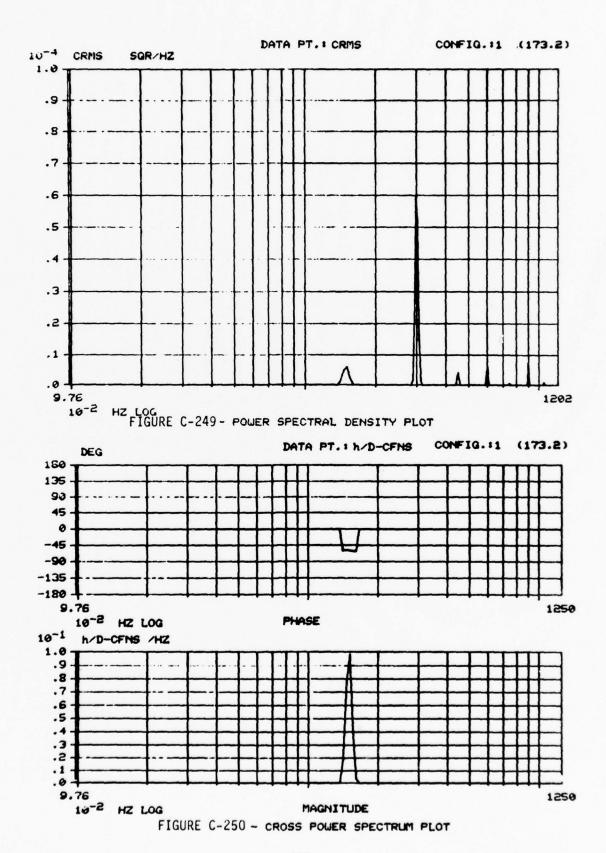
DATA PT. : CFNS CONFIG. 11 (173.2) :5-1 1.0 .8 .6 h/D<sub>je</sub> = .2 .0 -1.0-500 1000 1500 2000 2500 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-244 - TIME HISTORY

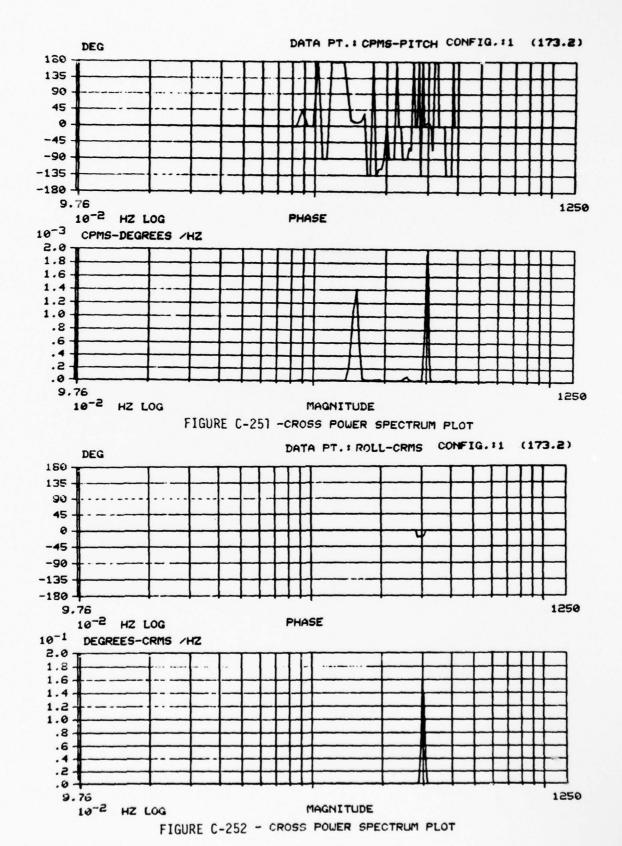


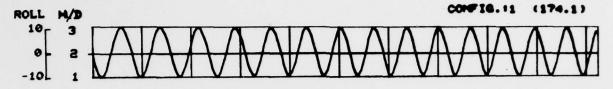


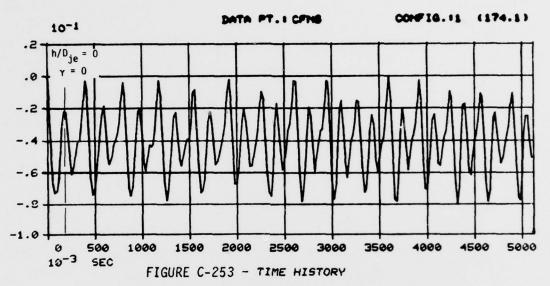


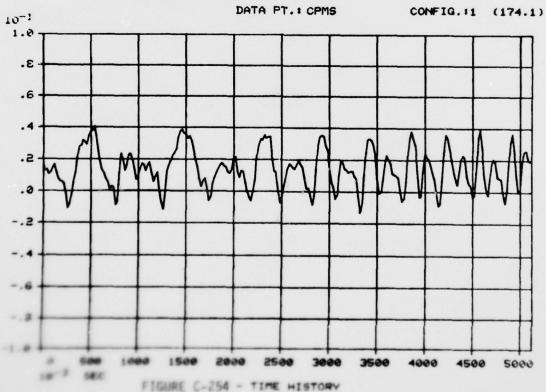


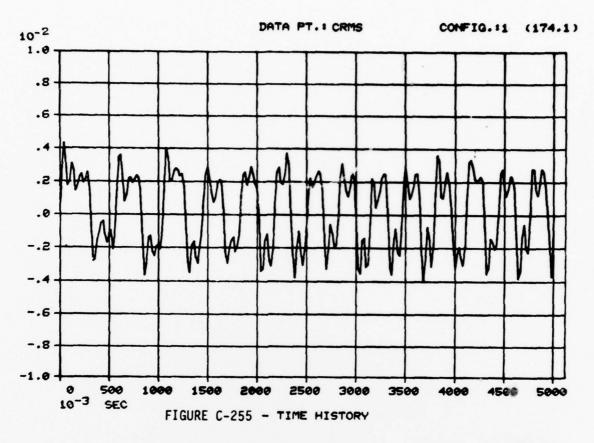


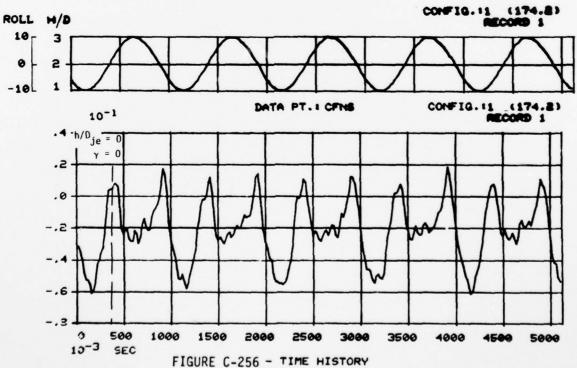


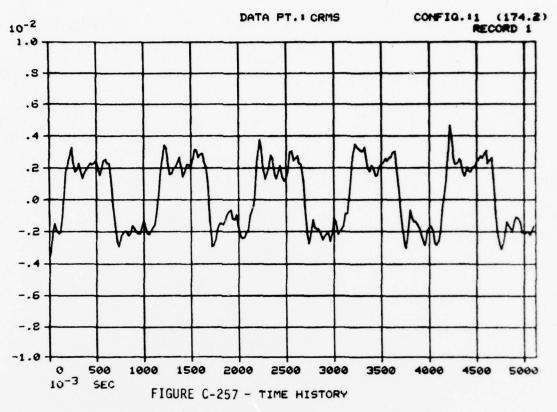


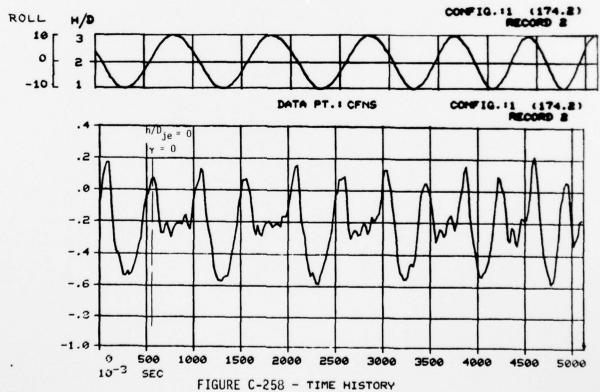


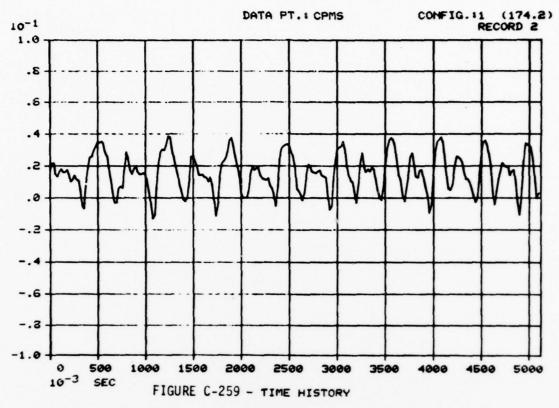


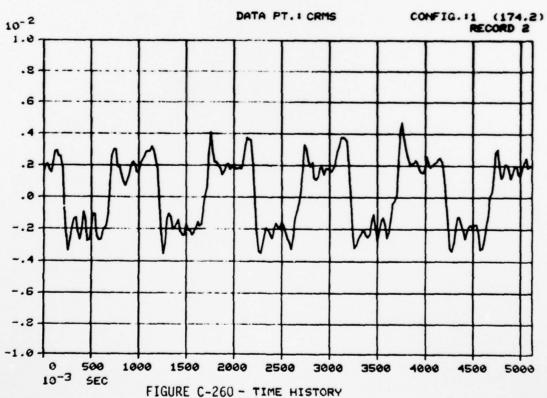


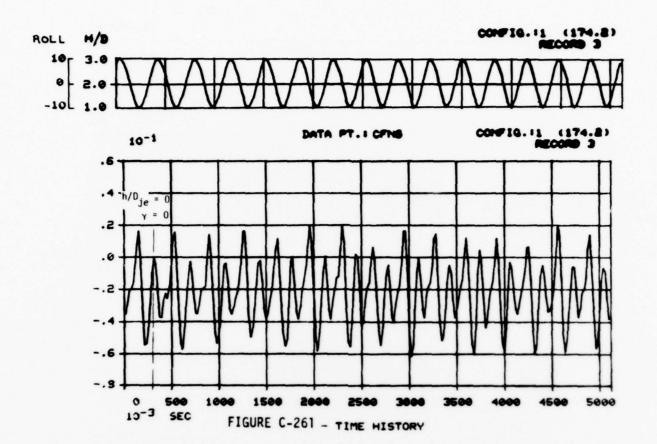


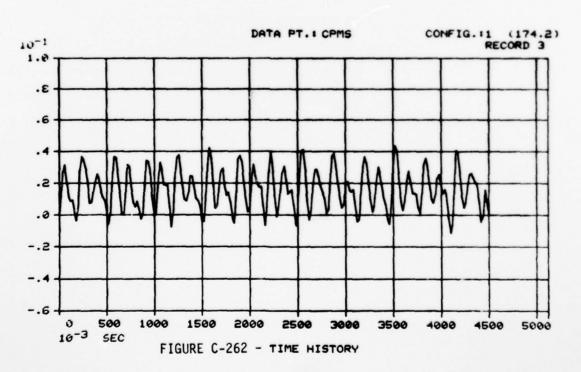


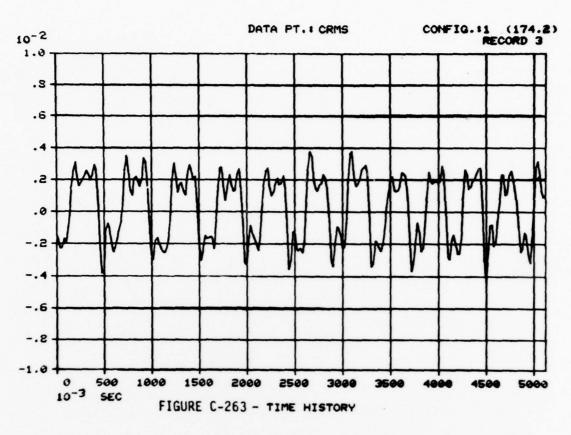


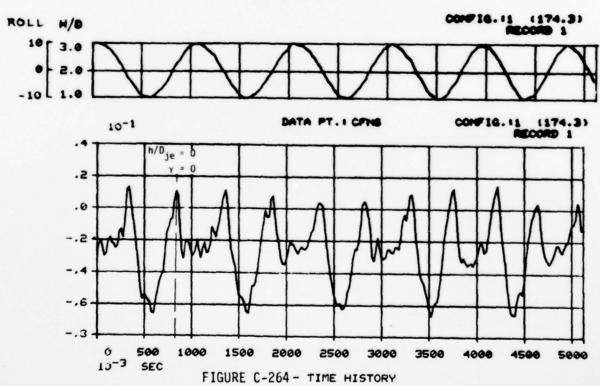


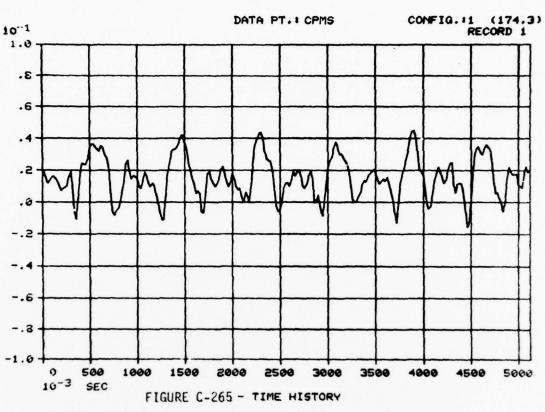


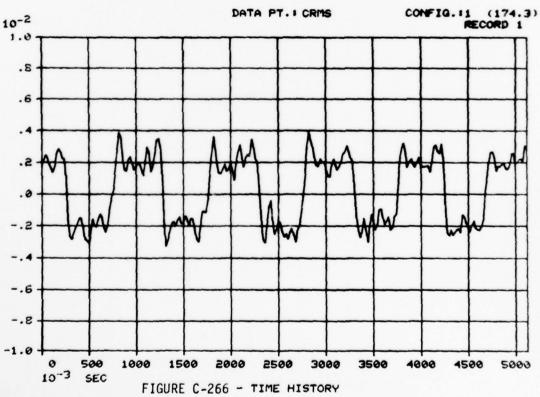


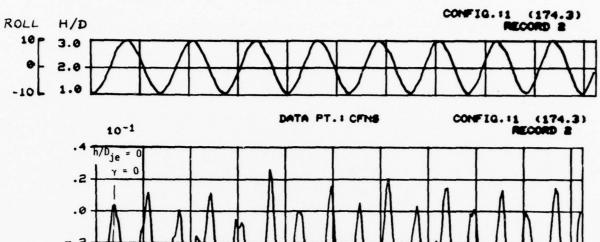


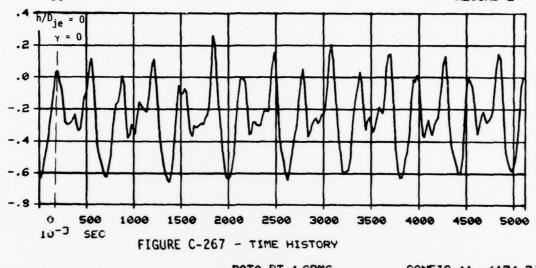


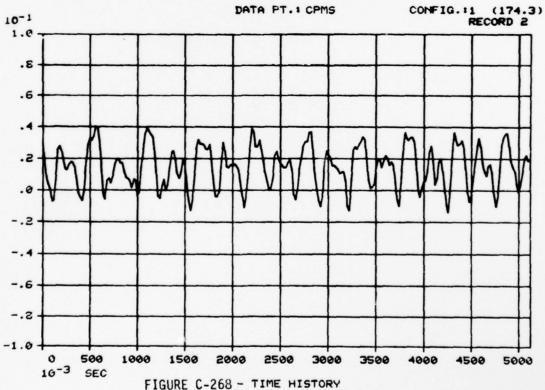


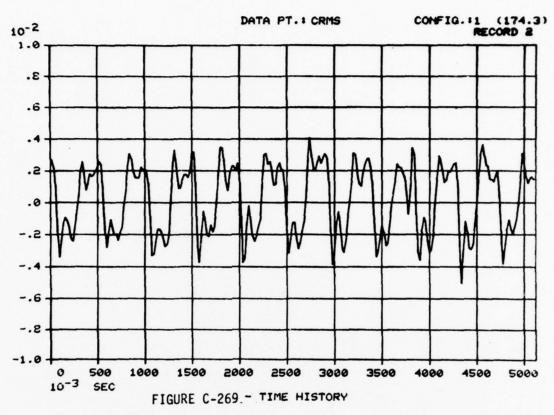


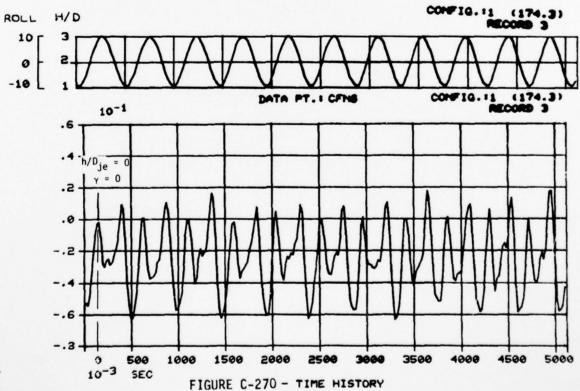


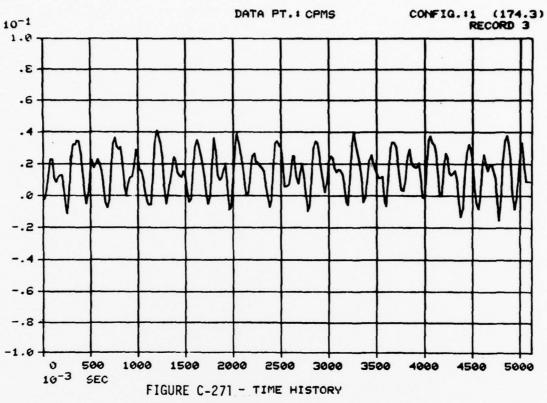


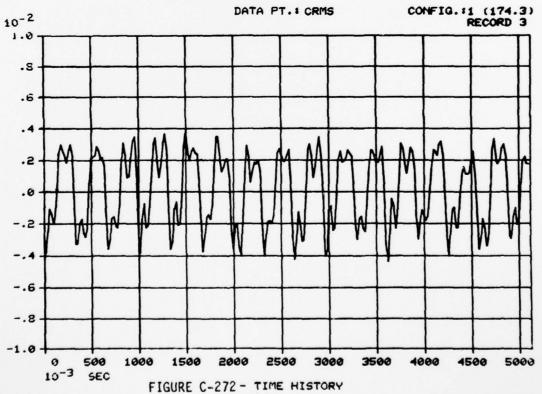


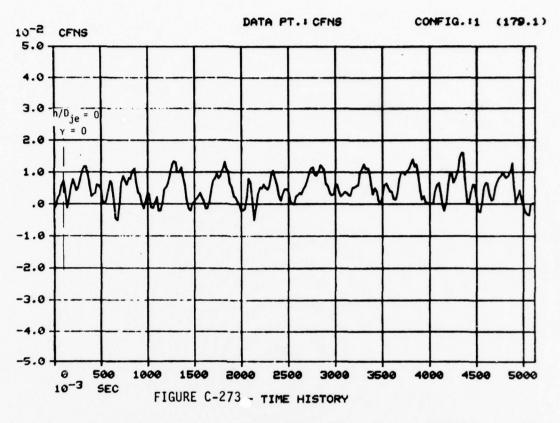


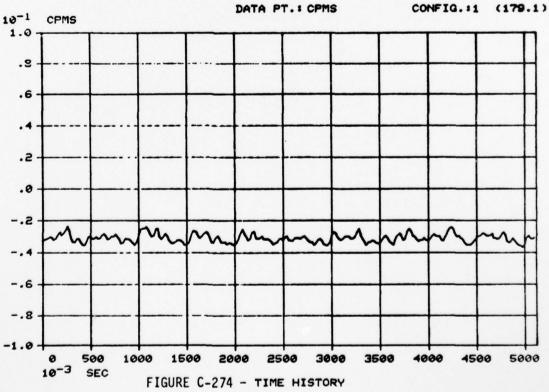


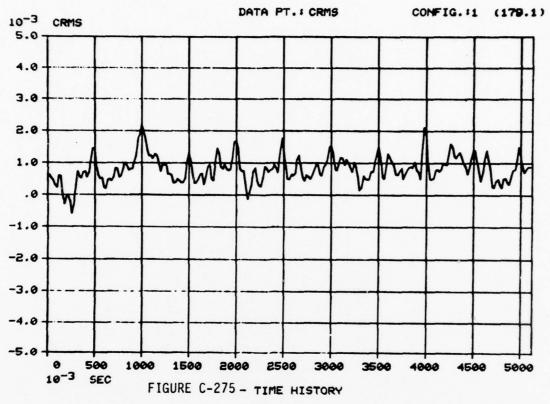


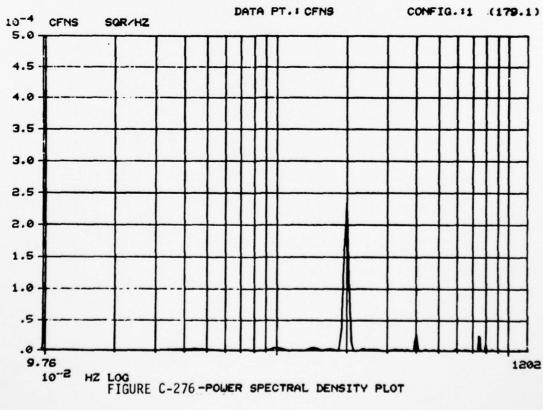


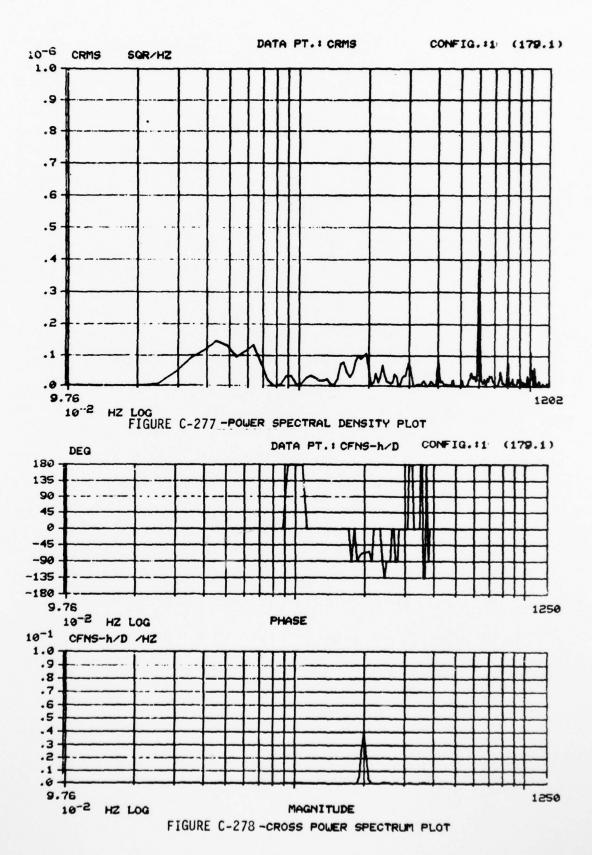












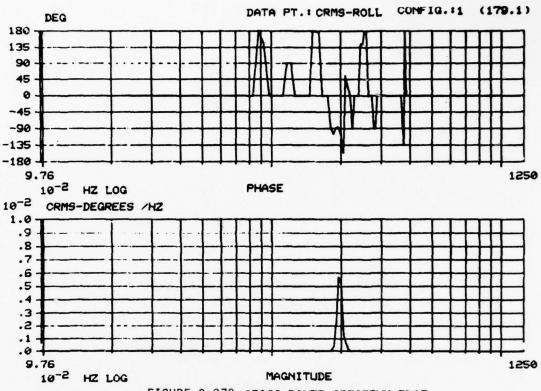
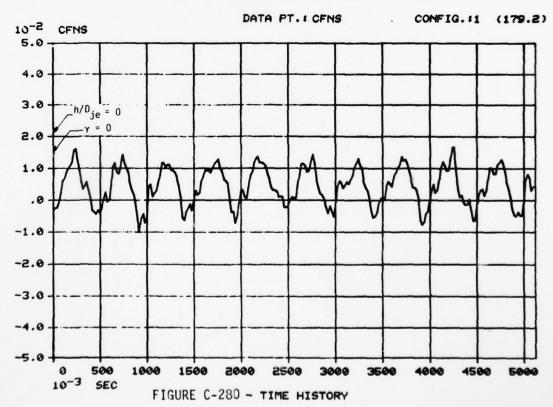
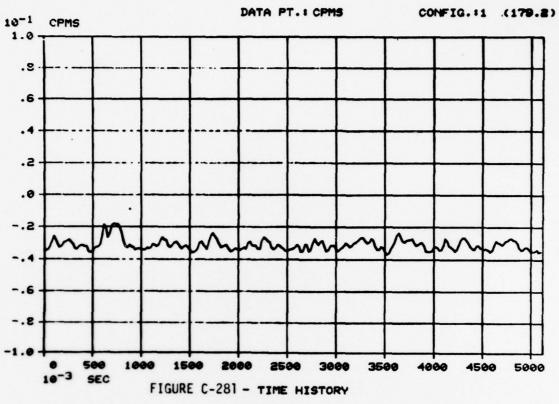


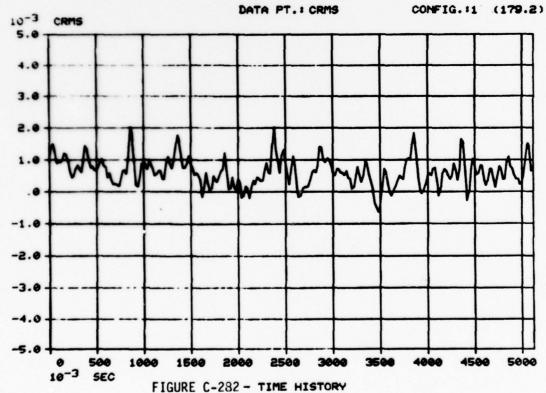
FIGURE C-279 - CROSS POWER SPECTRUM PLOT

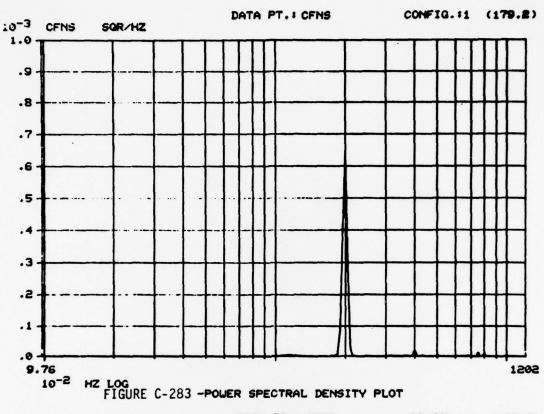


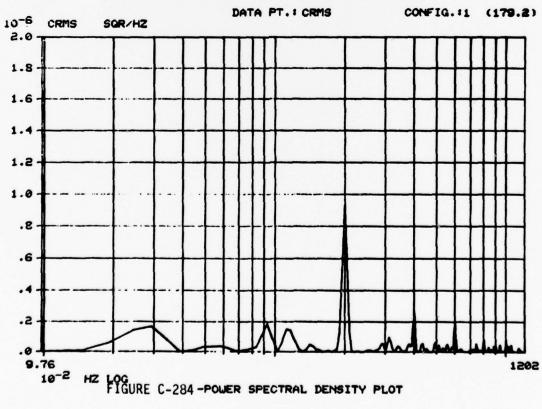
AD-A062 097 MCDONNELL AIRCRAFT CO ST LOUIS MO F/G 1/2 LIFT SYSTEM INDUCED AERODYNAMICS OF V/STOL AIRCRAFT IN A MOVING--ETC(U) SEP 78 J H KAMMAN, C L HALL N62269-77-C-0365 UNCLASSIFIED NADC-77-107-30-VOL-2 NL 4 0F9 AD AO6 2097 

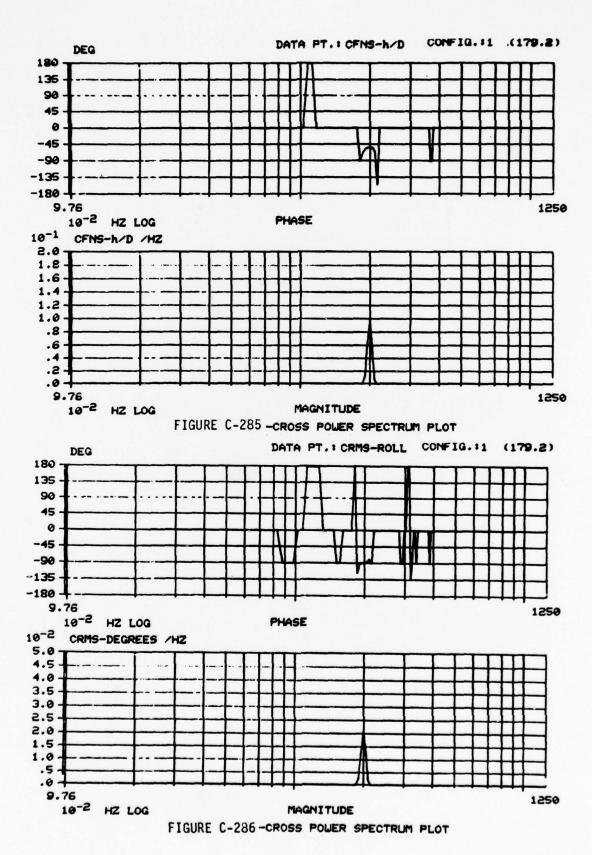


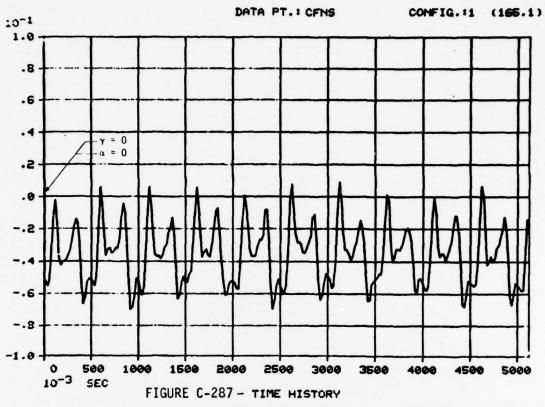


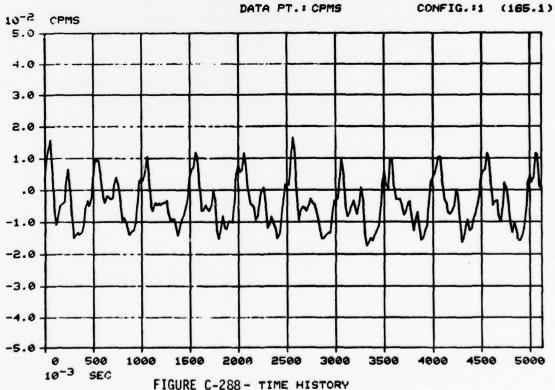


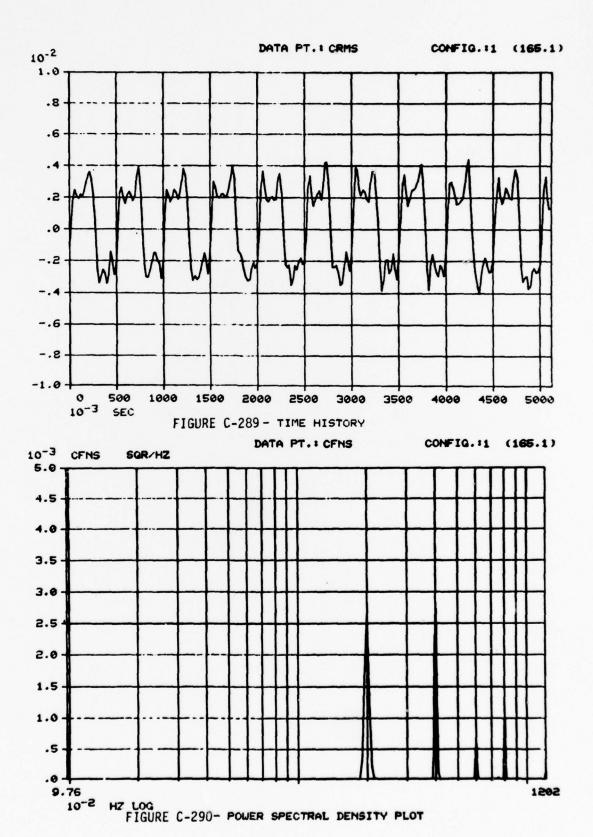


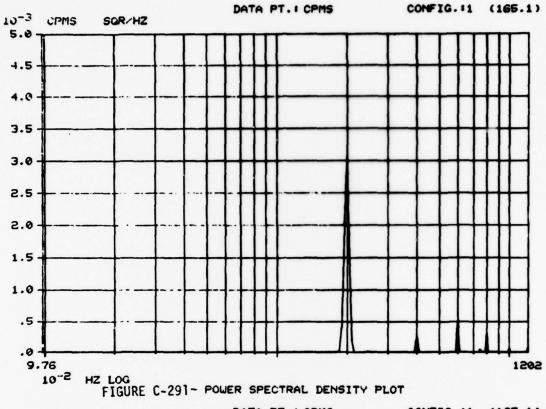


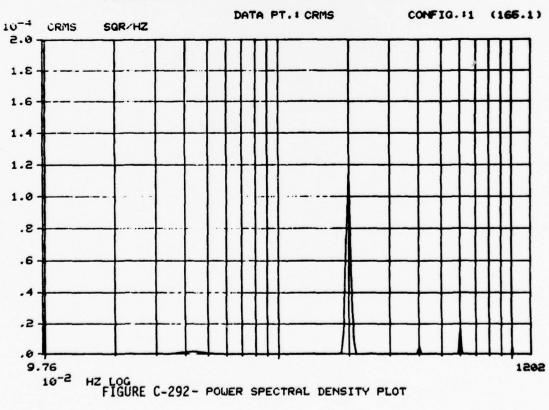


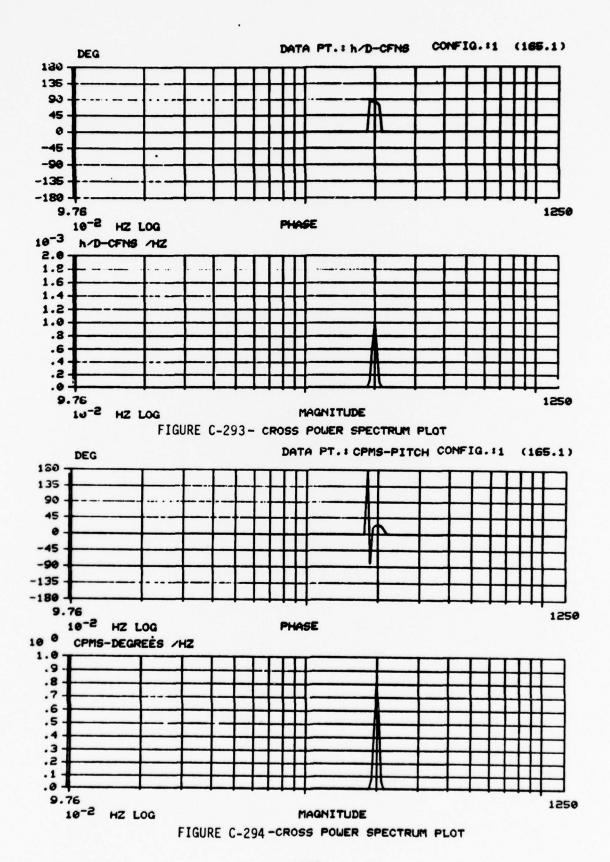


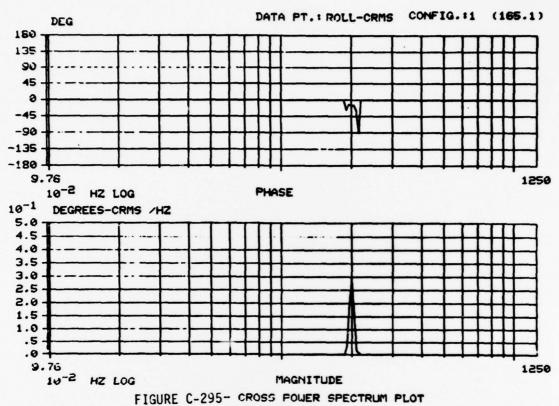




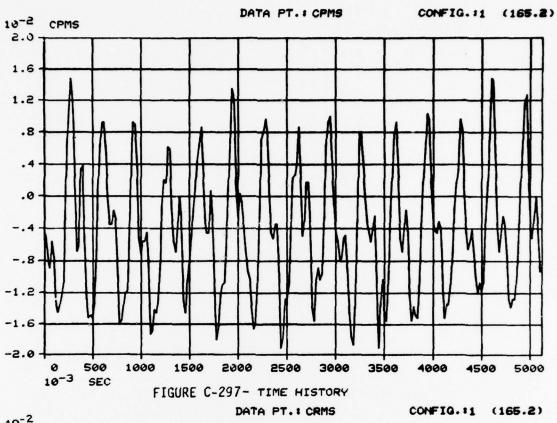


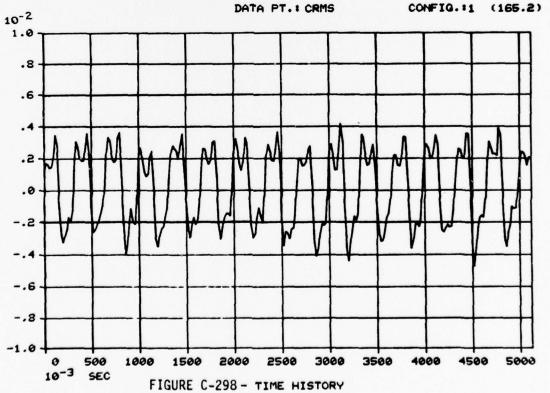


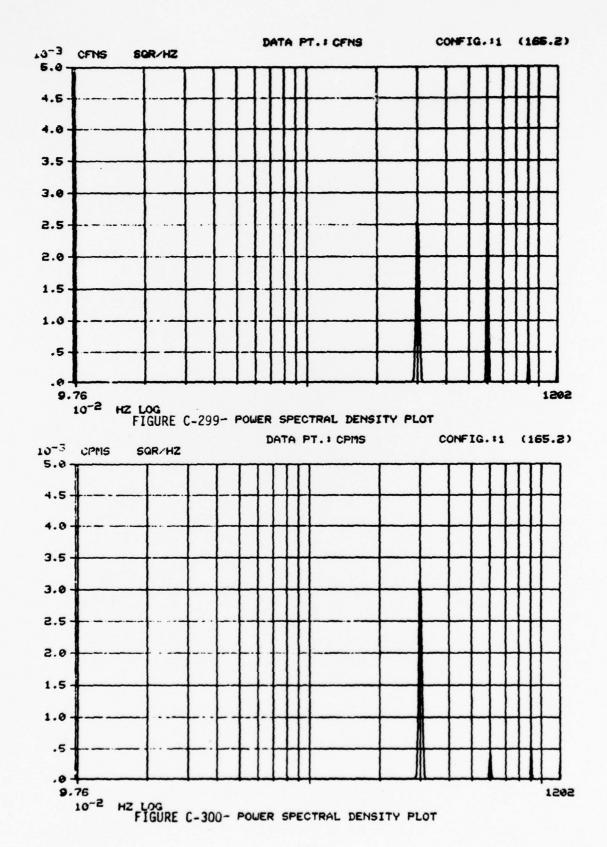


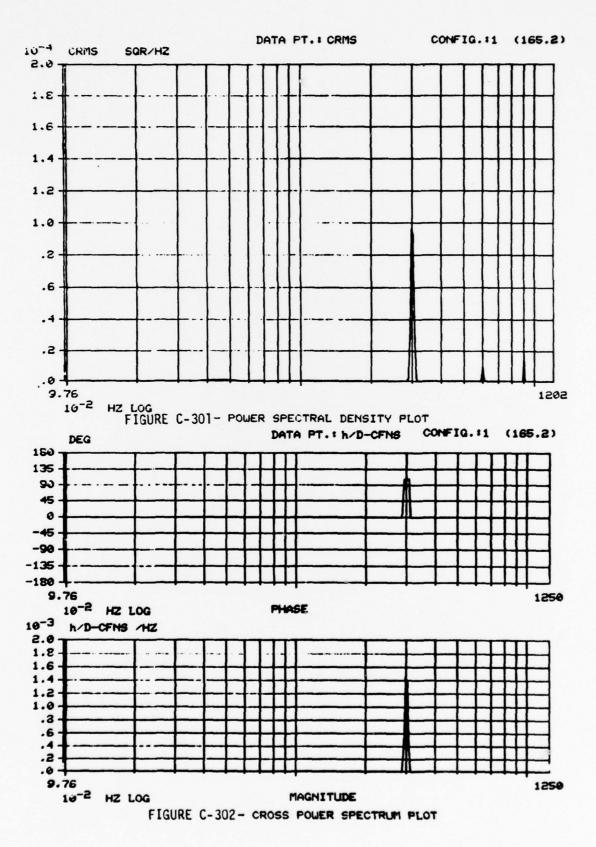


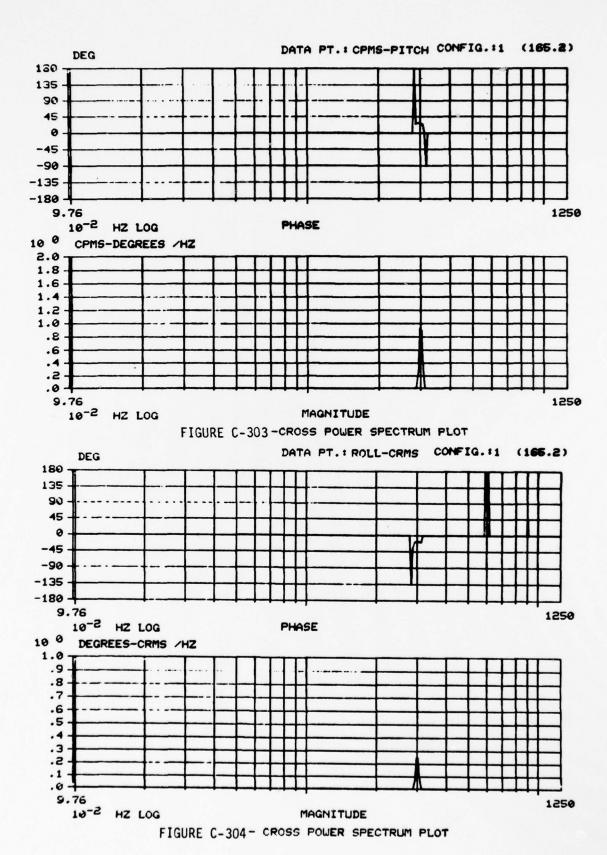
CONFIG.:1 (165.2) DATA PT.: CFNS 10-1 .8 ٠6  $\alpha = 0$  $\gamma = 0$ .0 -.8 -1.0-2000 500 1500 2500 3500 4500 10-3 SEC FIGURE C-296 - TIME HISTORY

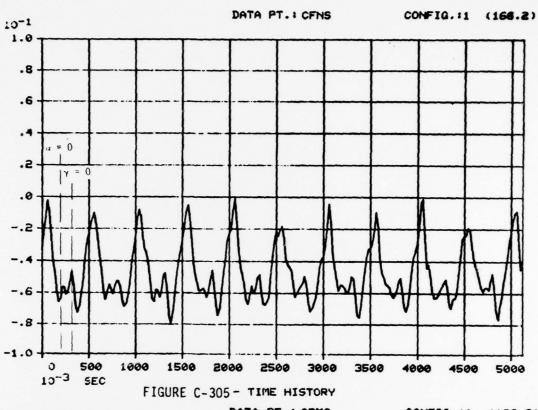


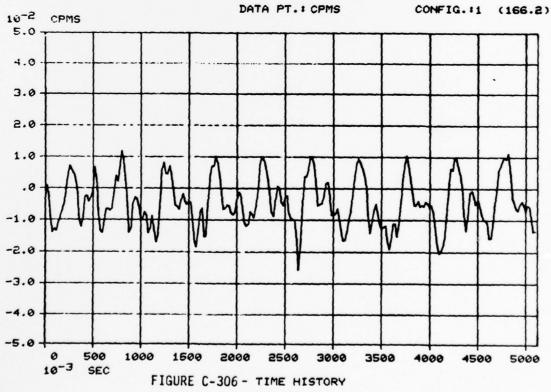


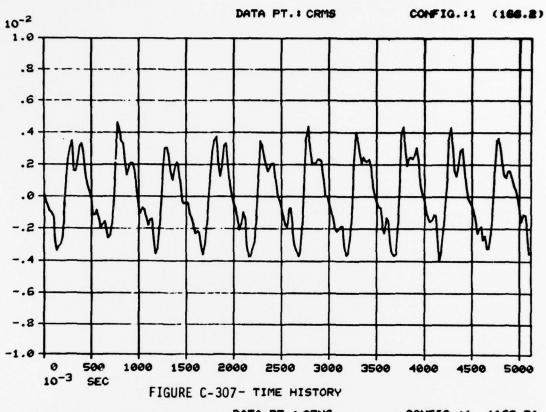


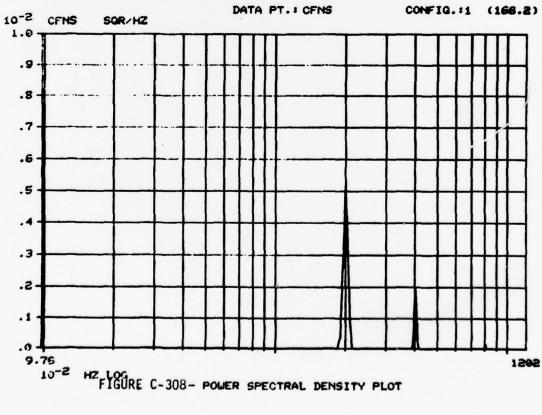


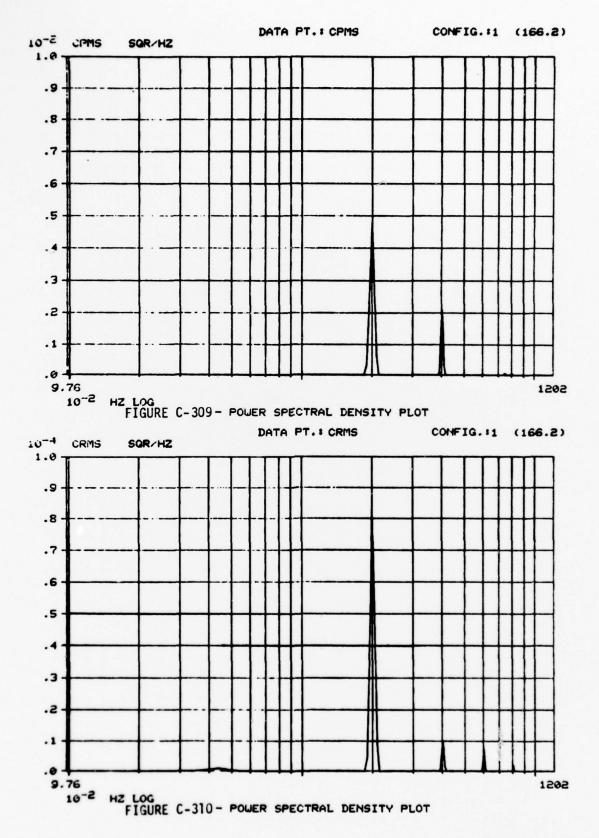


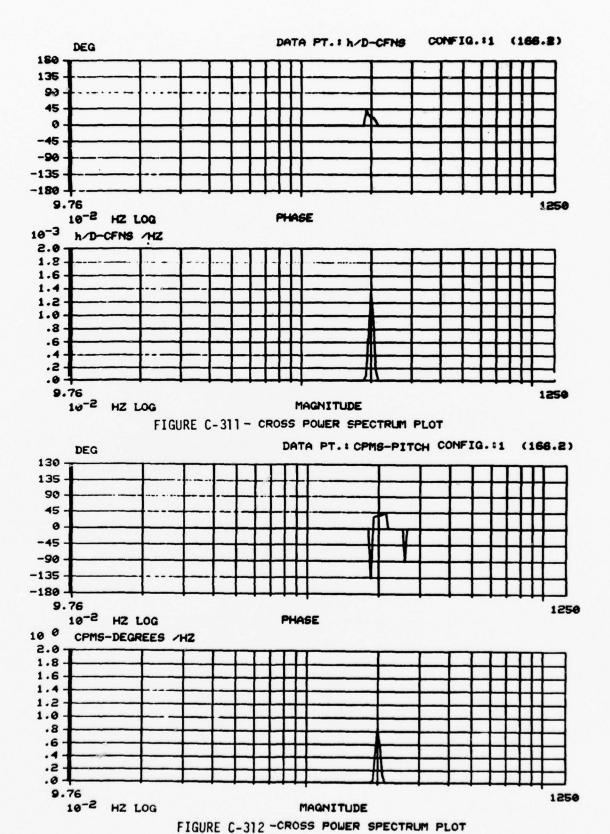


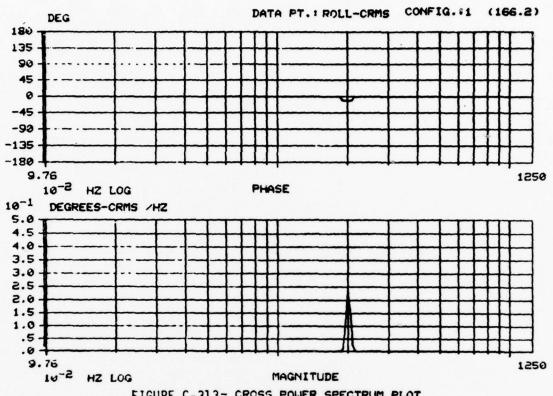




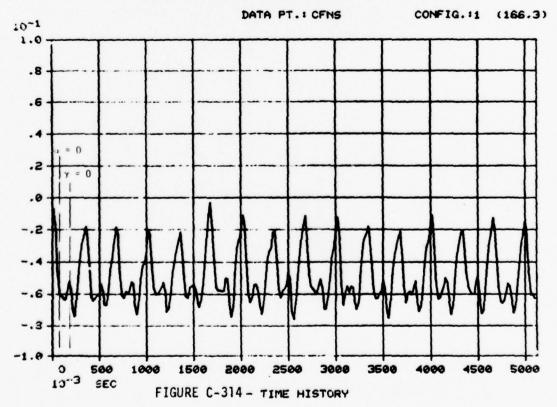


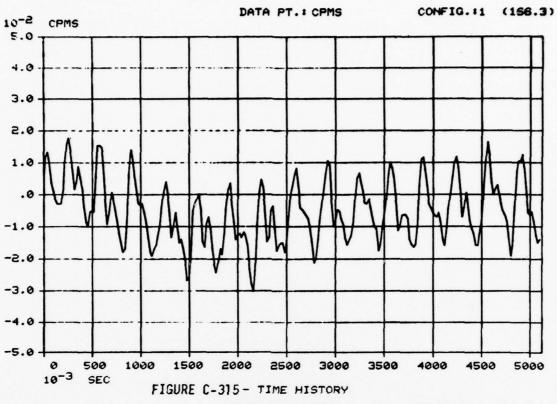


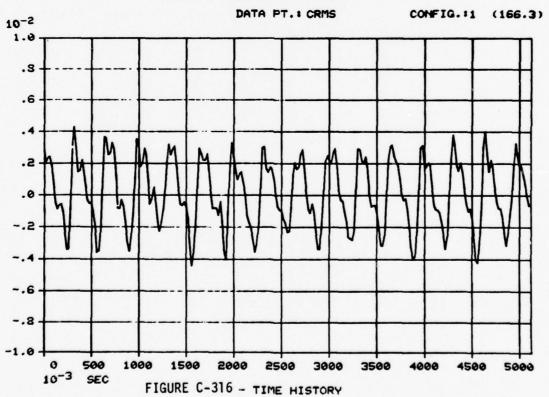












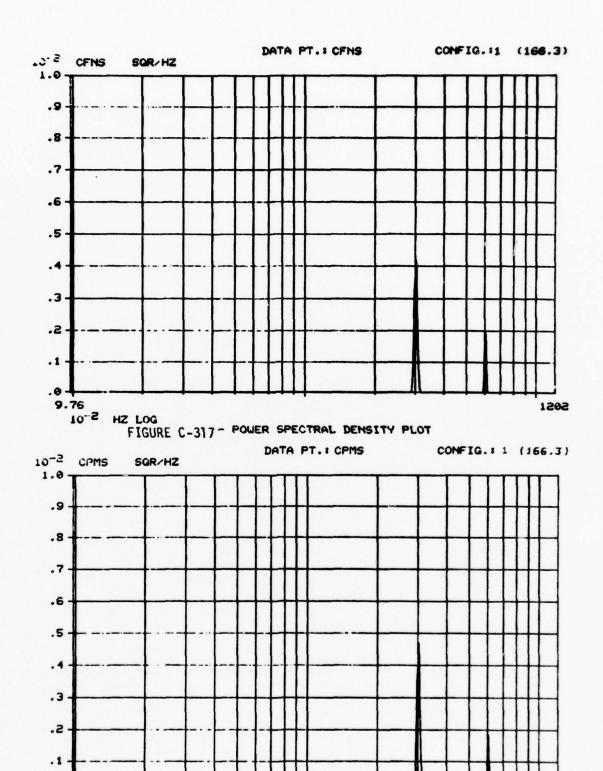


FIGURE C-318 - POWER SPECTRAL DENSITY PLOT

1202

9.76

10"2 HZ LOG

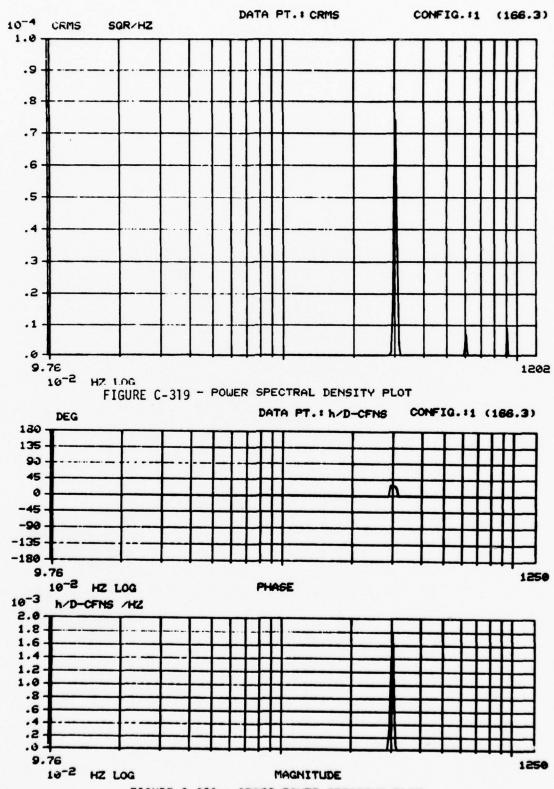
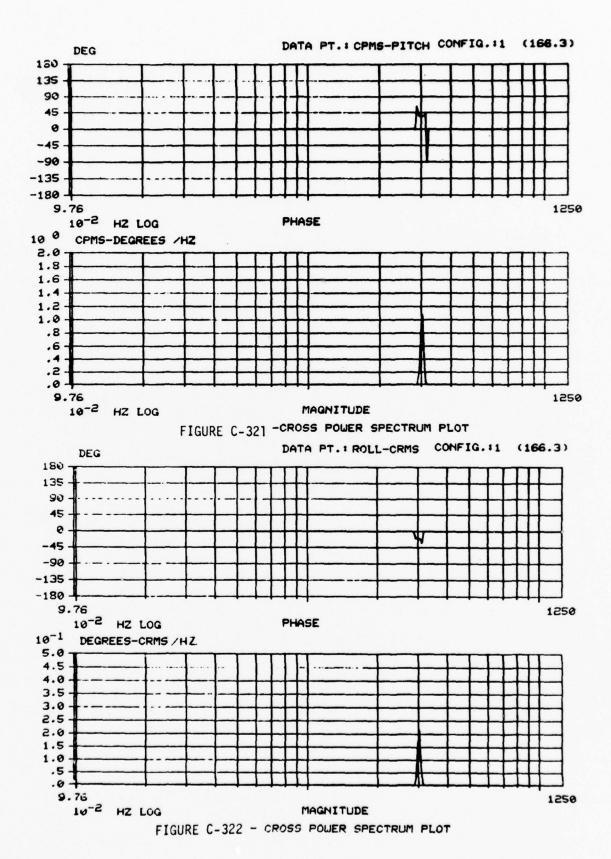
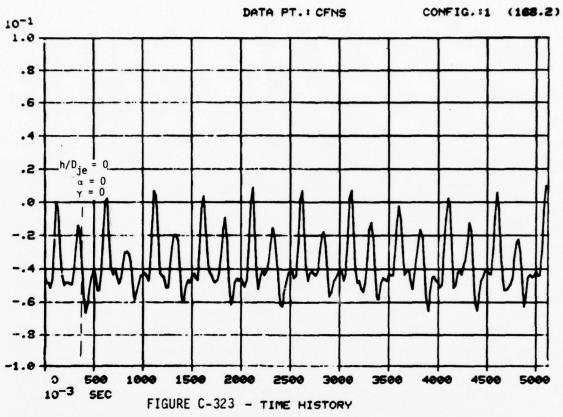
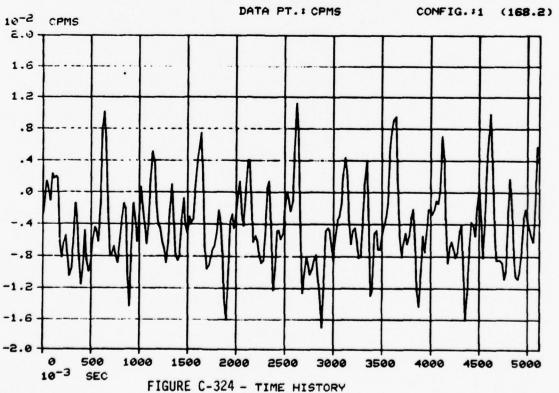
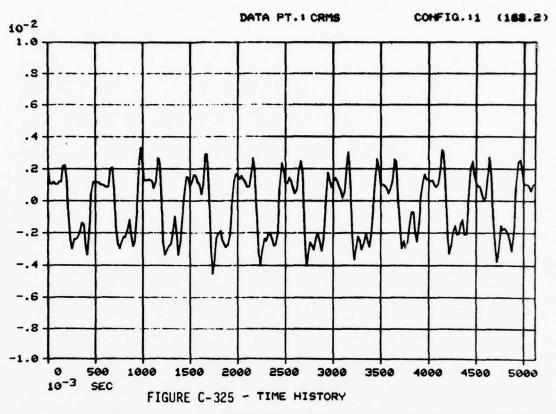


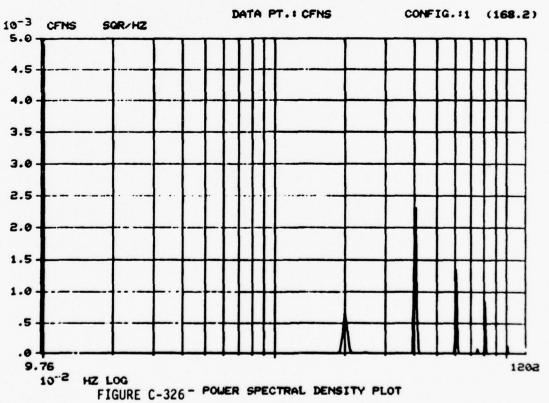
FIGURE C-320 - CROSS POWER SPECTRUM PLOT

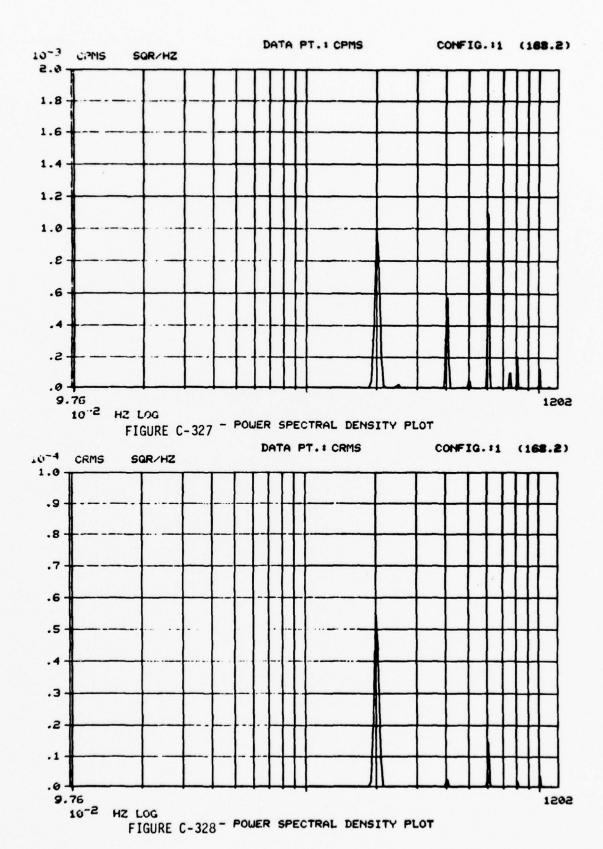












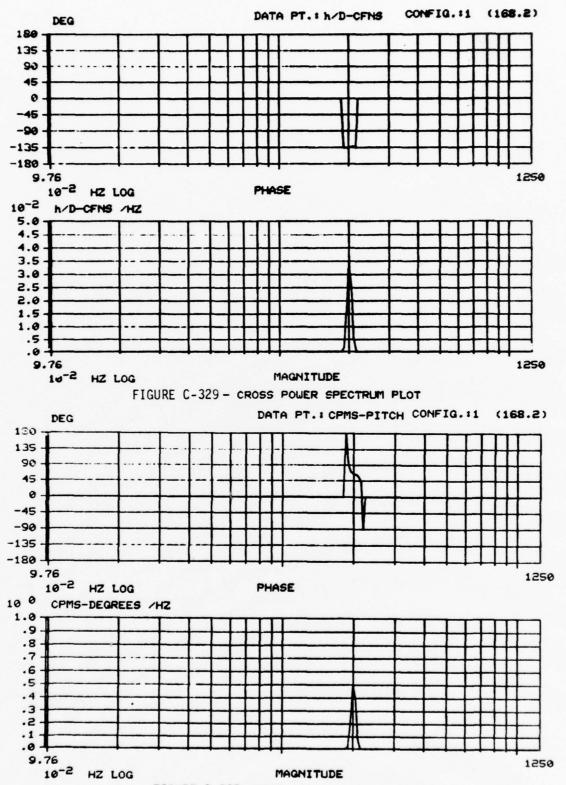


FIGURE C-330 -CROSS POWER SPECTRUM PLOT

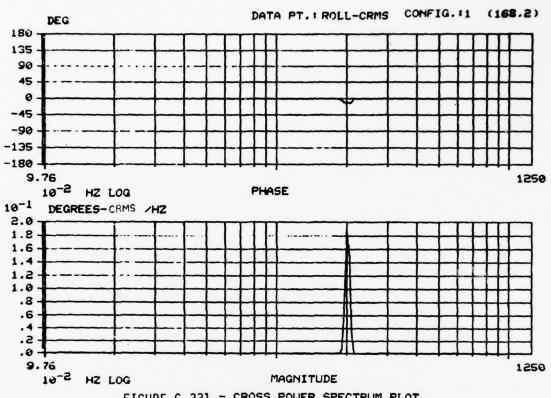
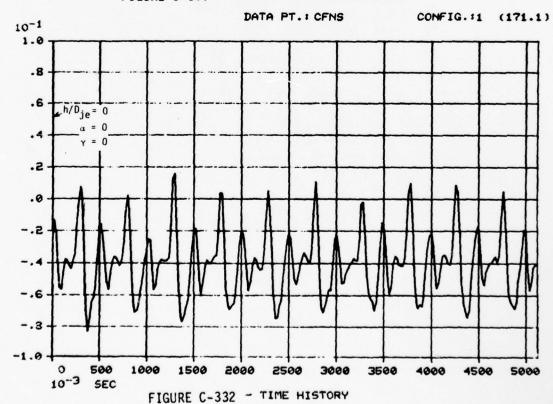
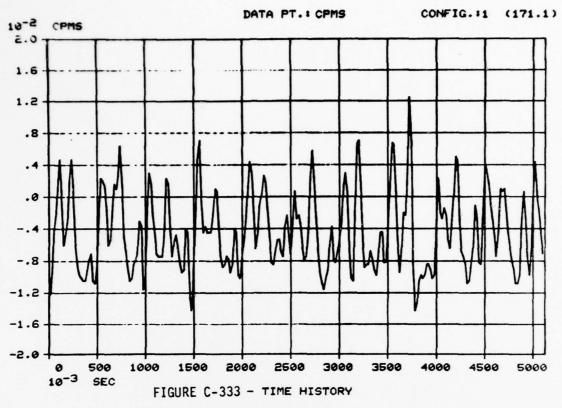
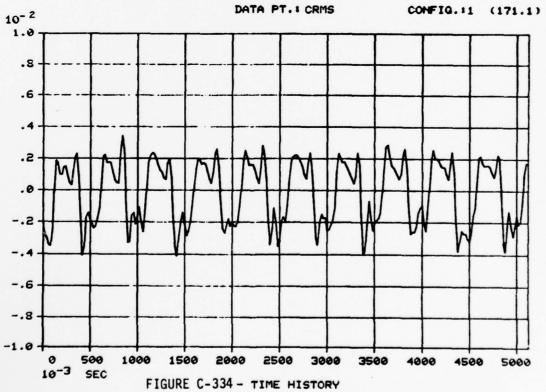
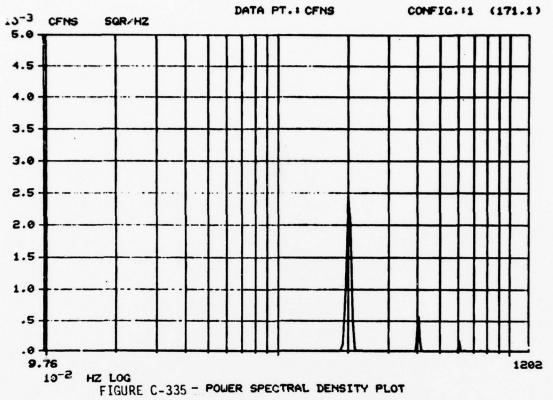


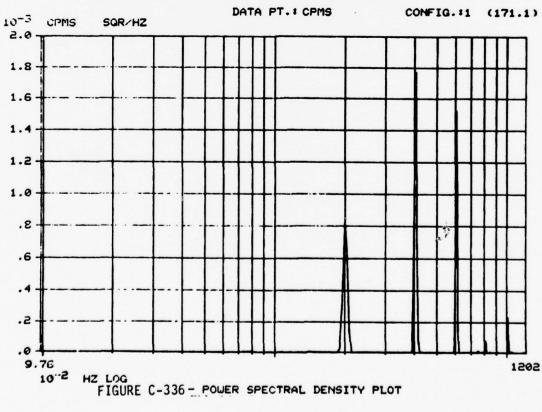
FIGURE C-331 - CROSS POWER SPECTRUM PLOT

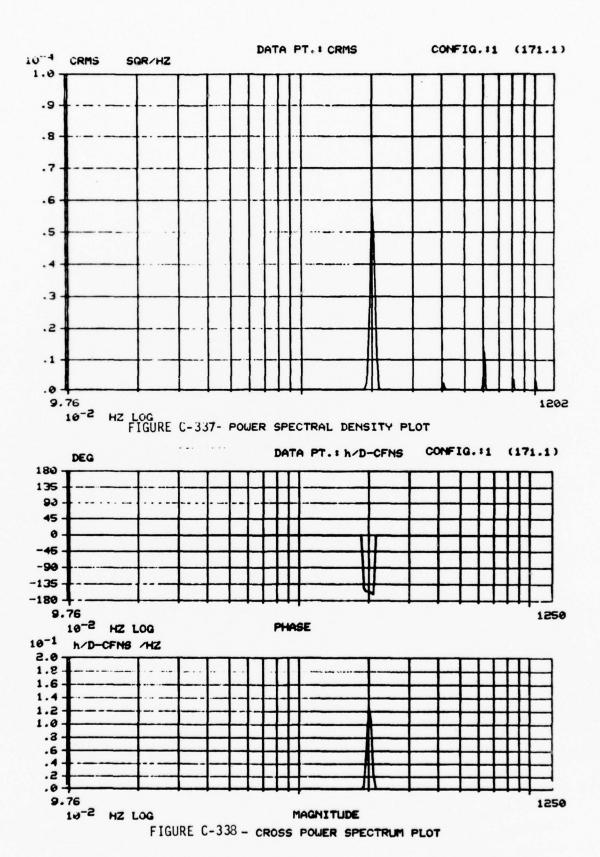


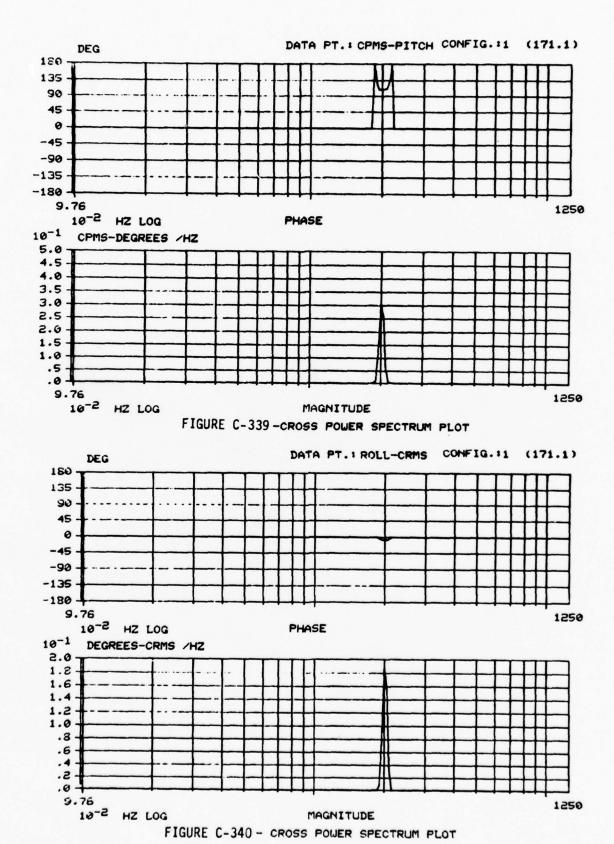


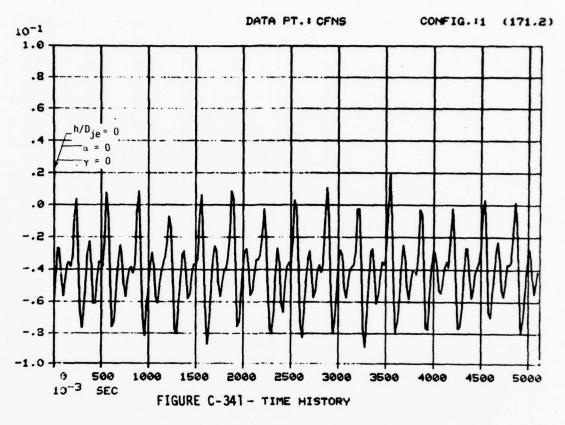


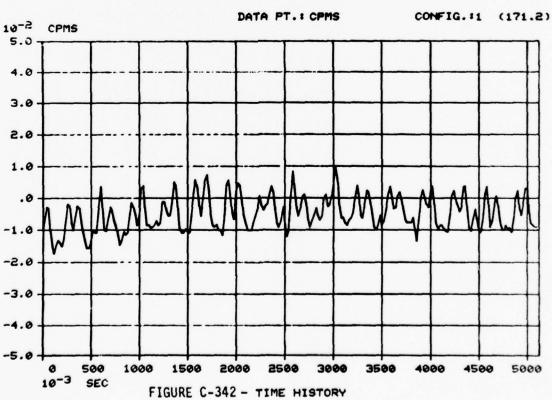


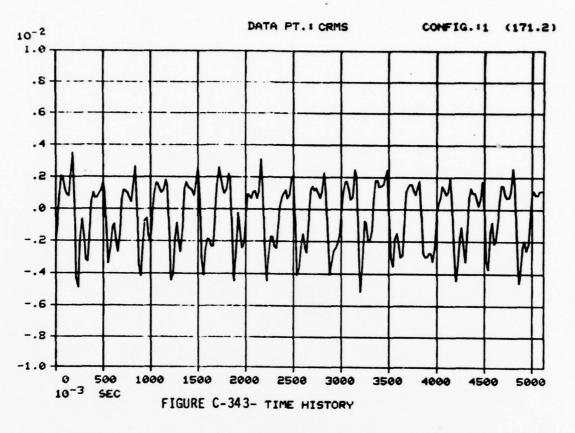


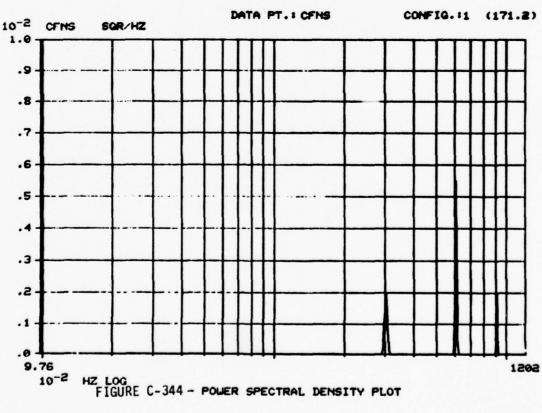


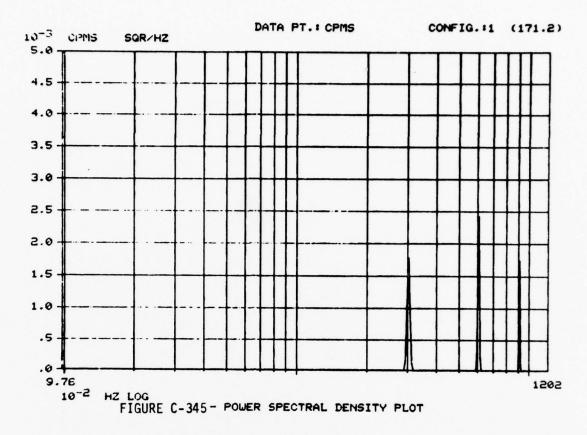


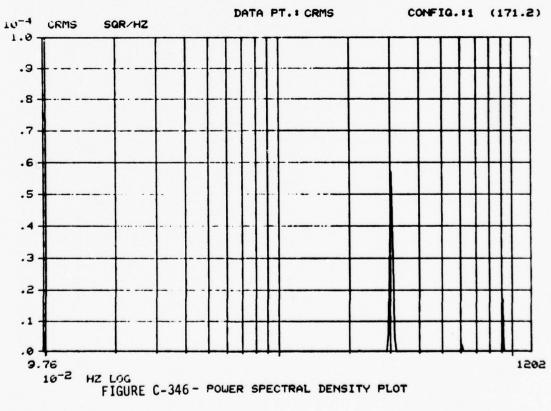












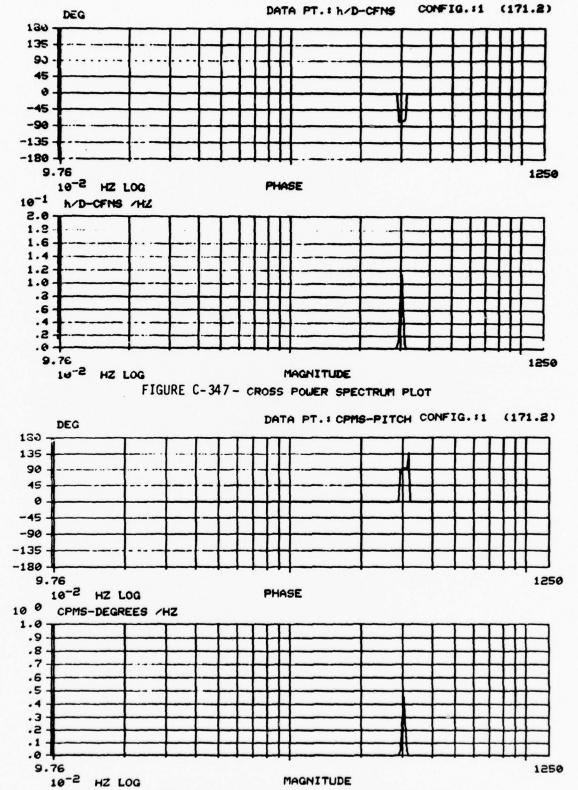
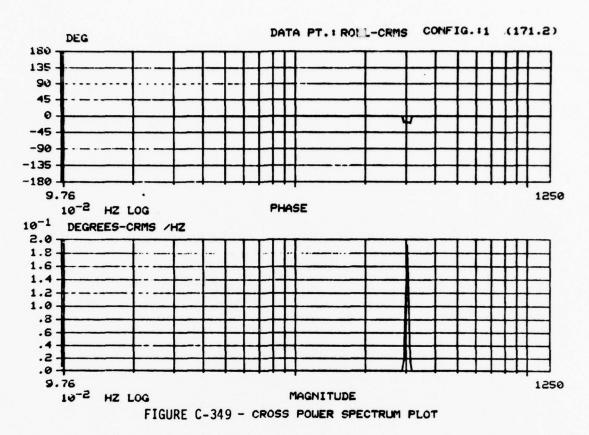
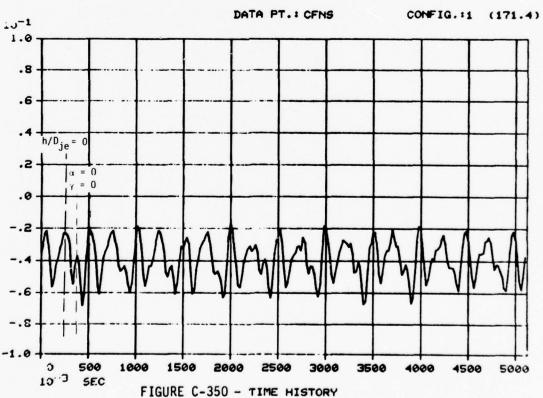
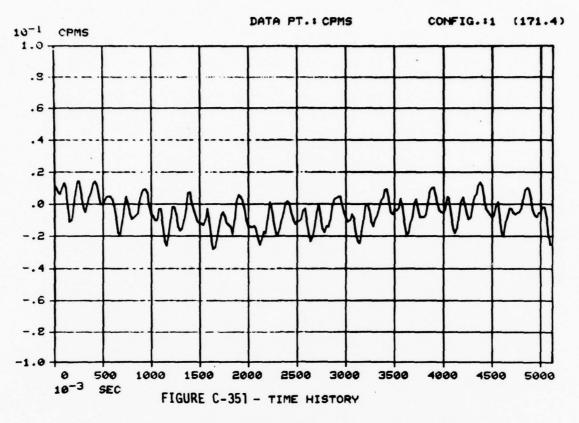
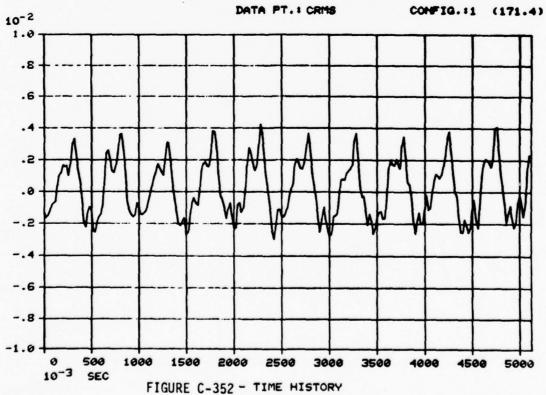


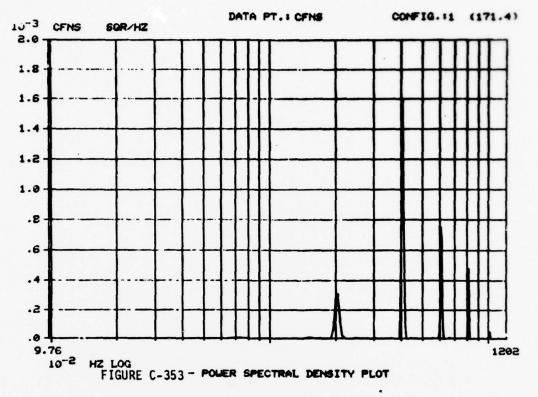
FIGURE C-348 -CROSS POWER SPECTRUM PLOT

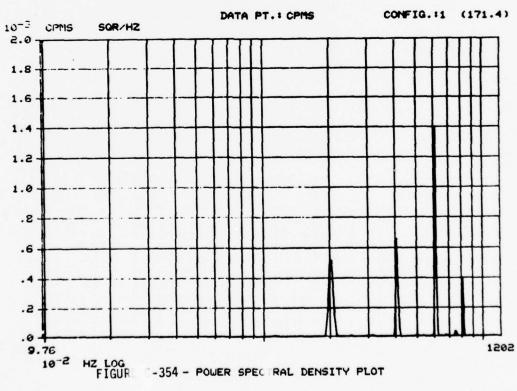


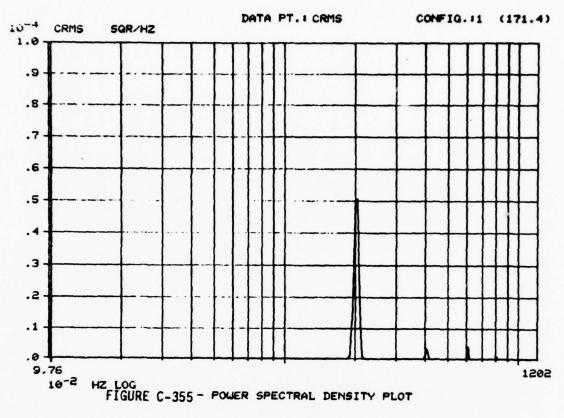












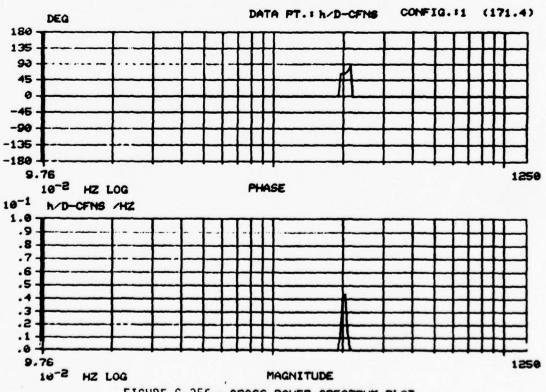
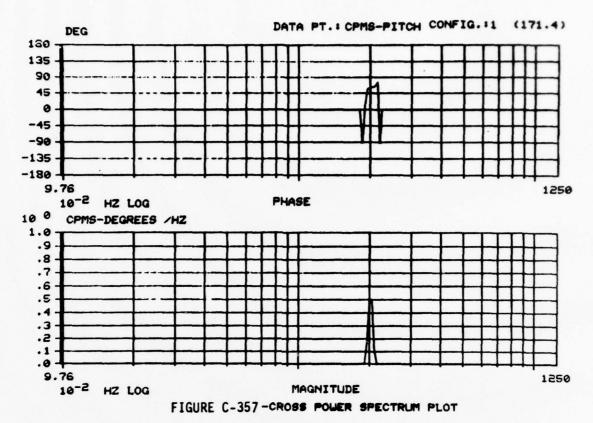


FIGURE C-356 - CROSS POWER SPECTRUM PLOT



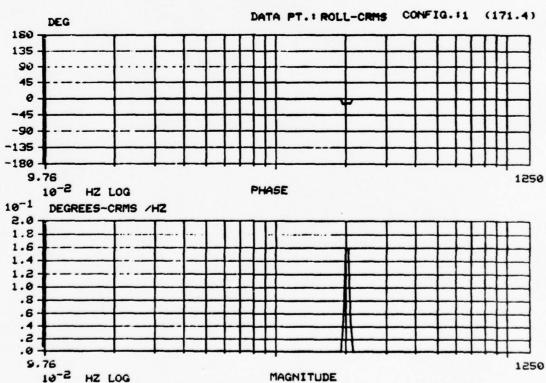
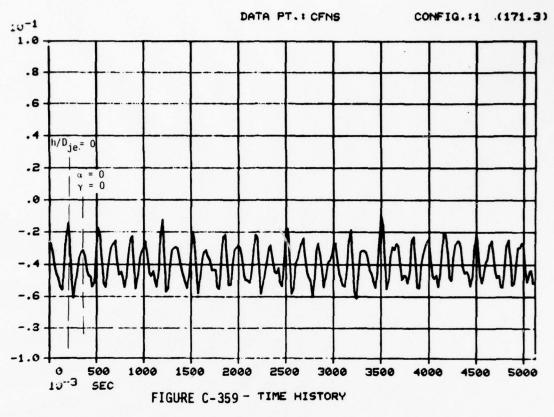
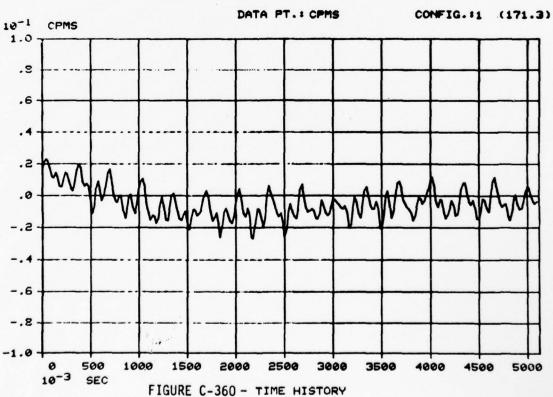
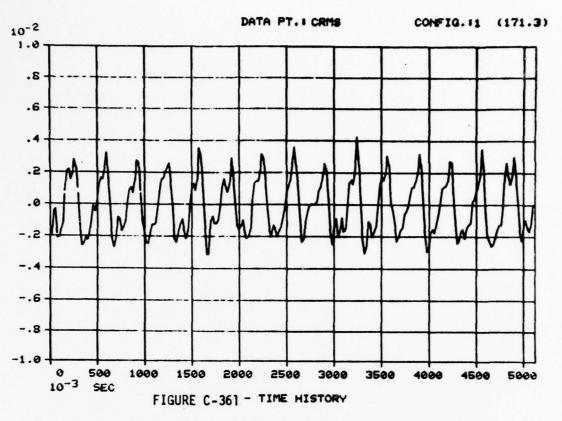
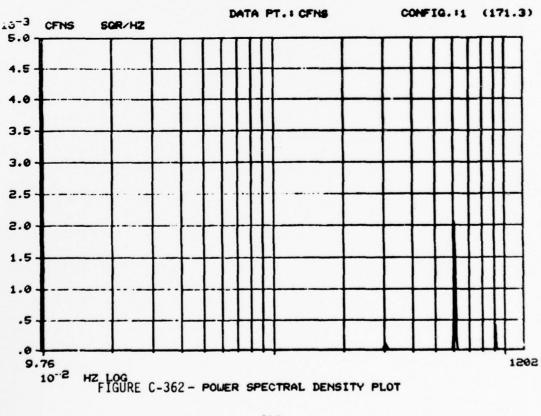


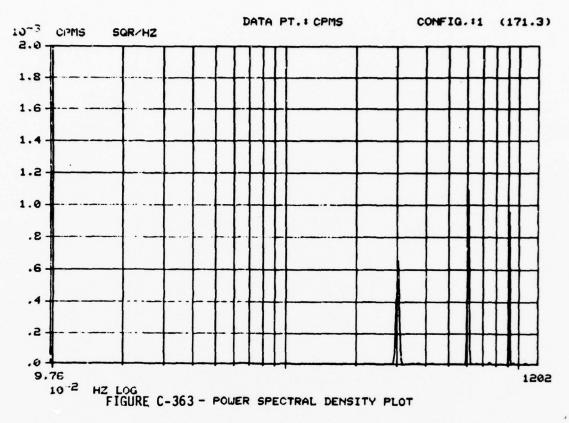
FIGURE C-358 - CROSS POWER SPECTRUM PLOT

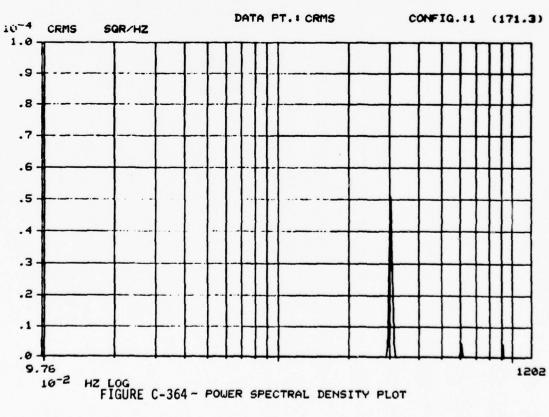


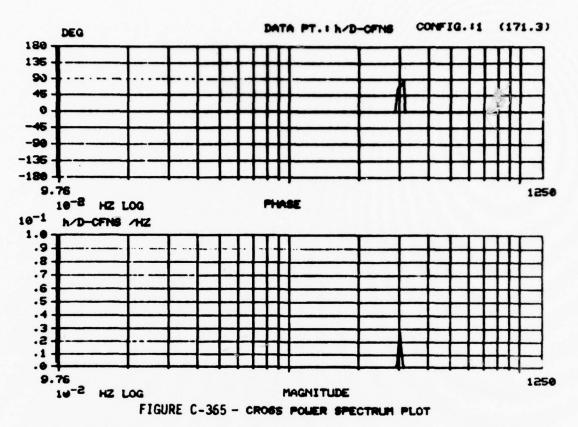


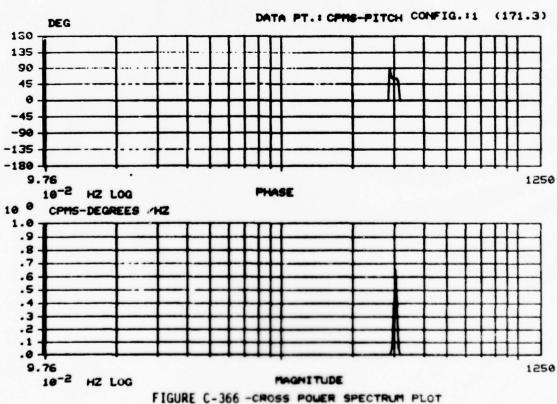


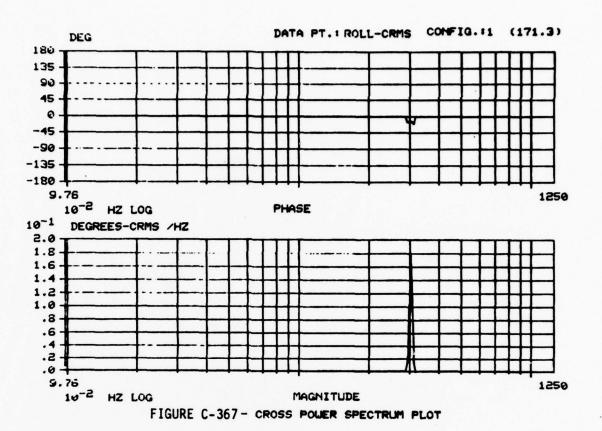


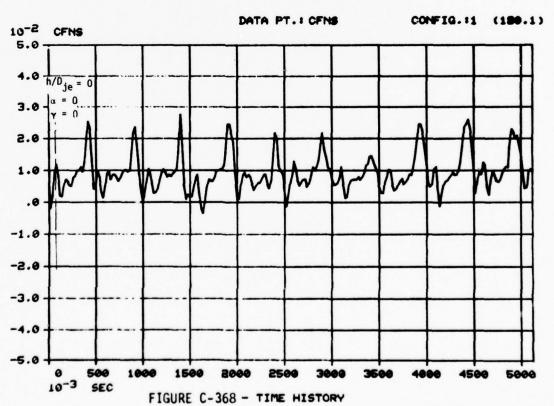


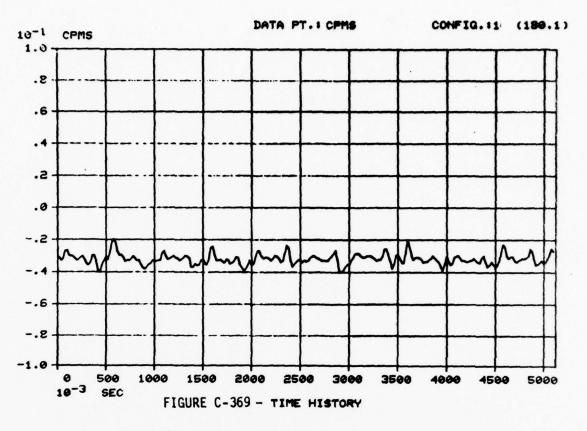


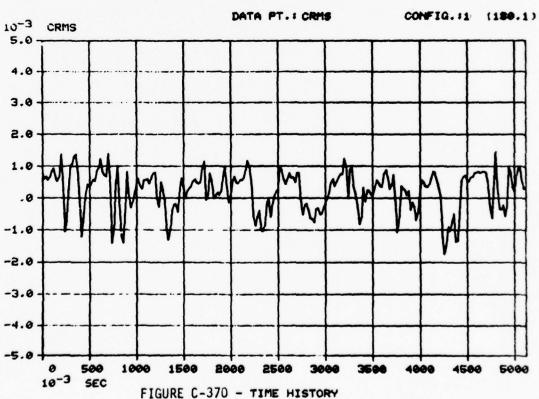


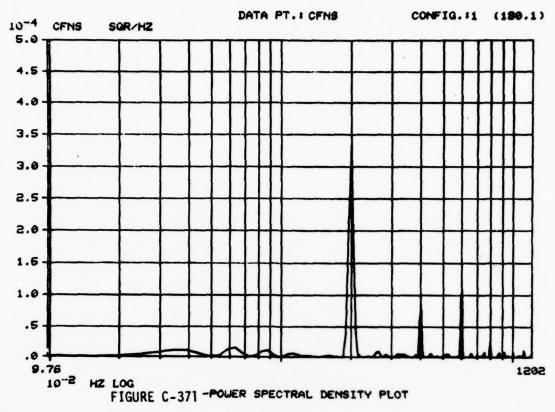


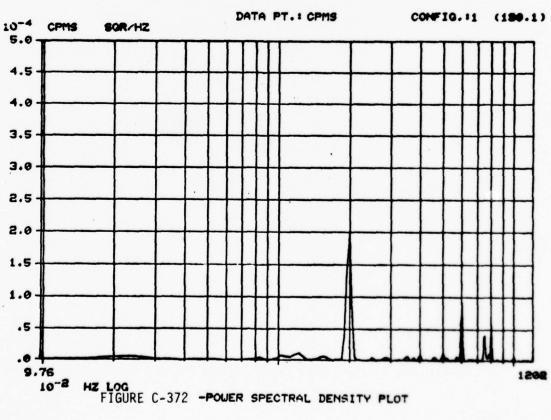


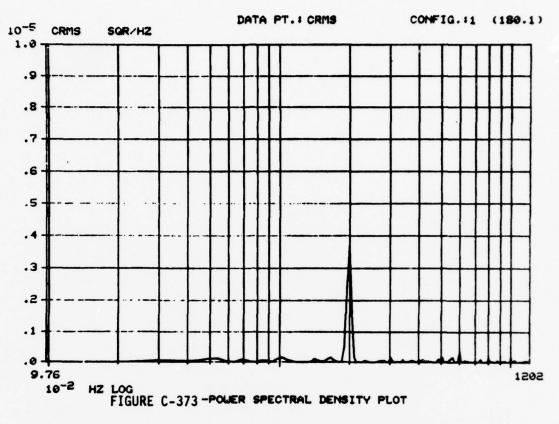


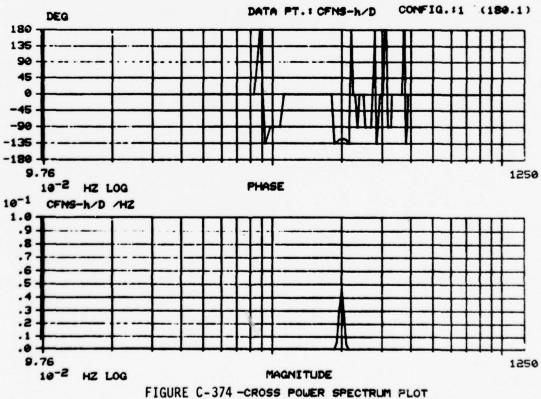












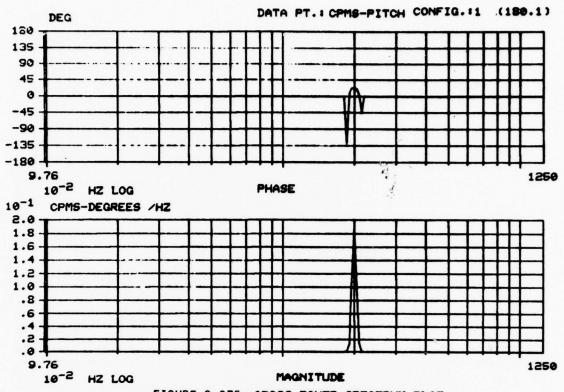


FIGURE C-375 -CROSS POWER SPECTRUM PLOT

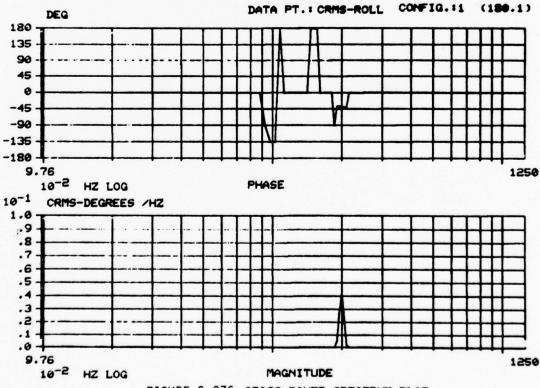
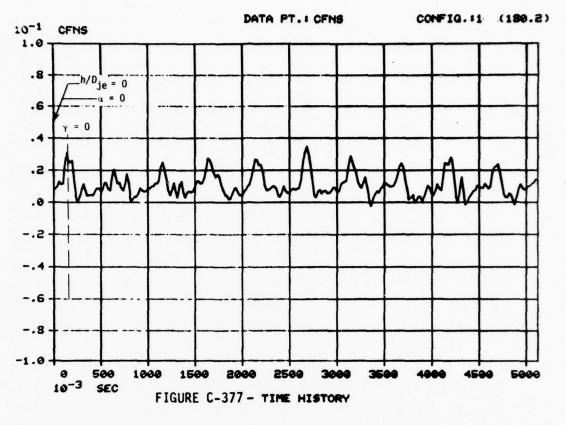
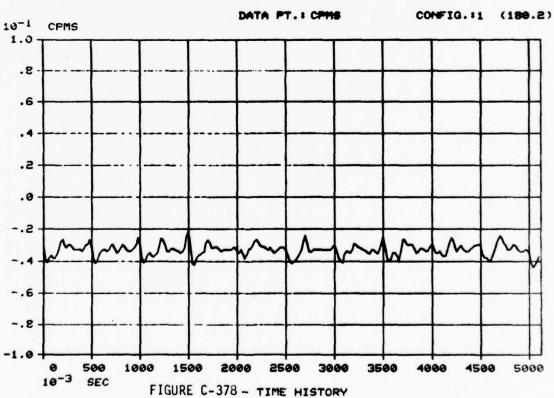
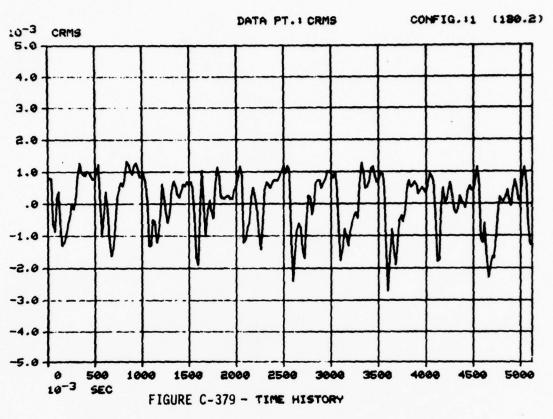
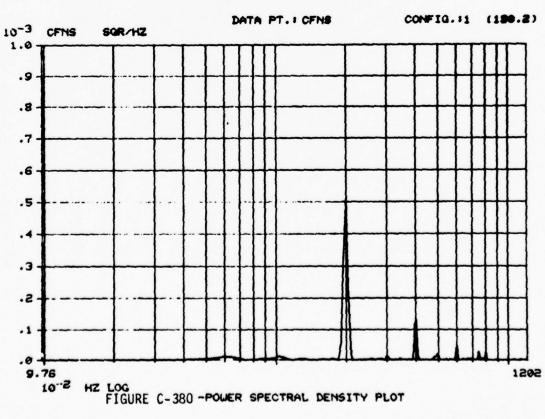


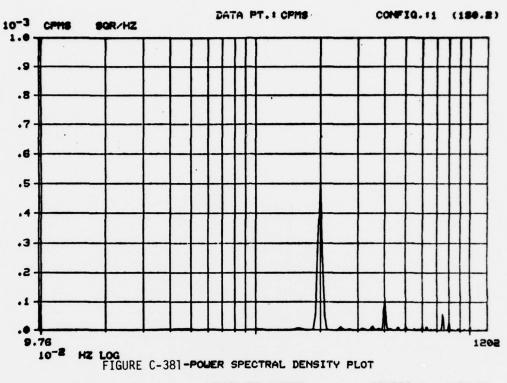
FIGURE C-376 -CROSS POWER SPECTRUM PLOT

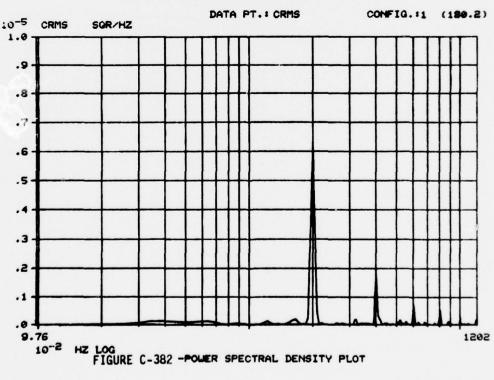


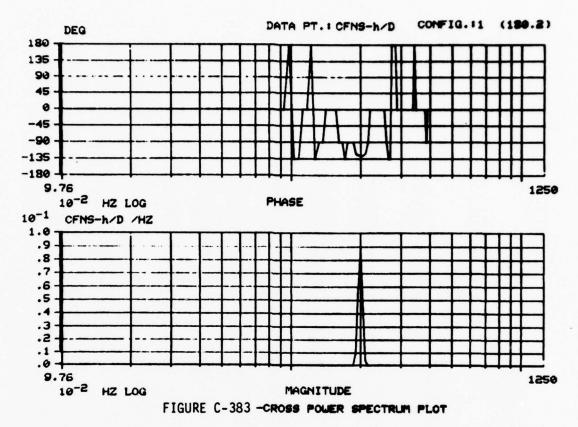












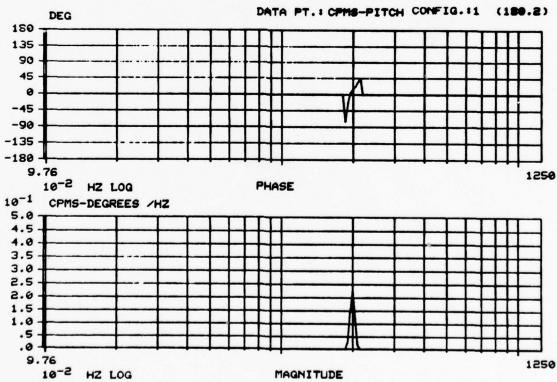
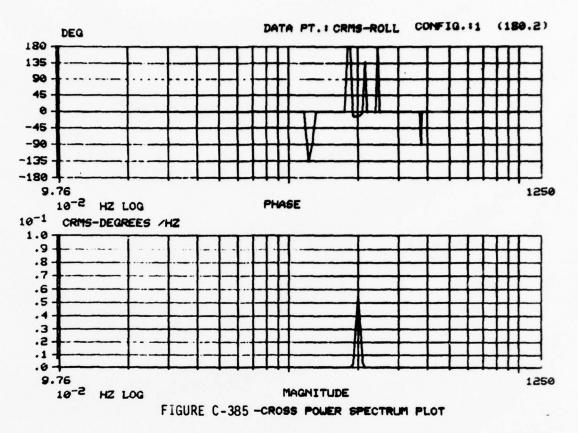
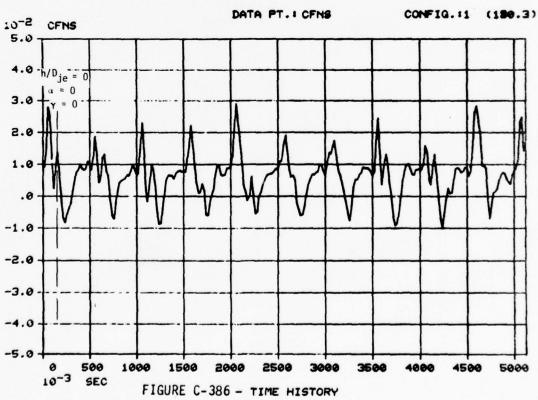
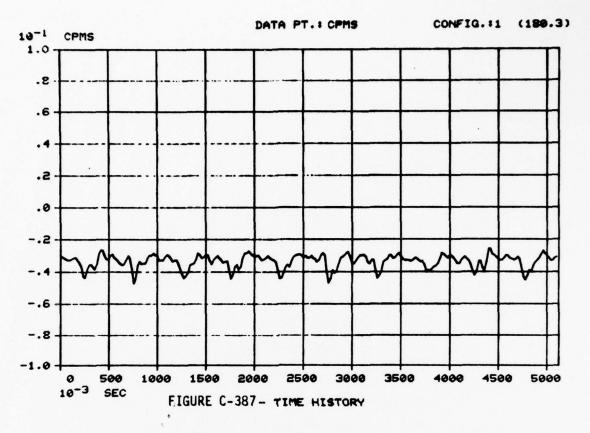
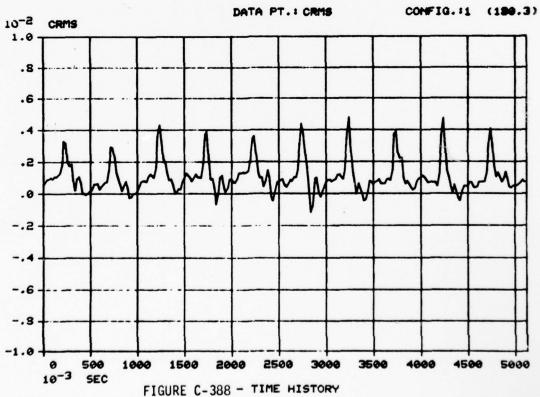


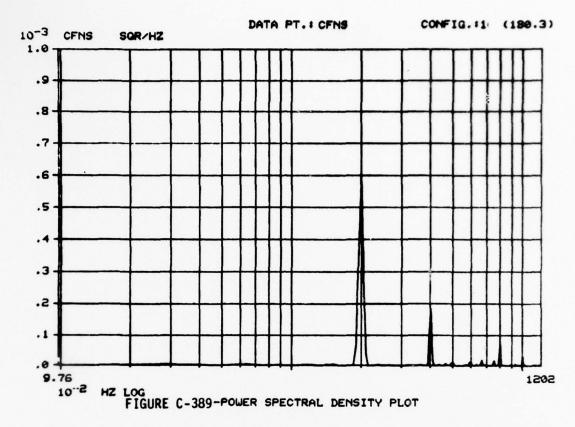
FIGURE C-384 -CROSS POWER SPECTRUM PLOT

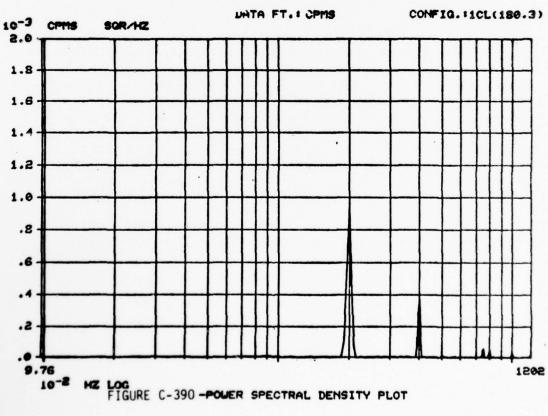


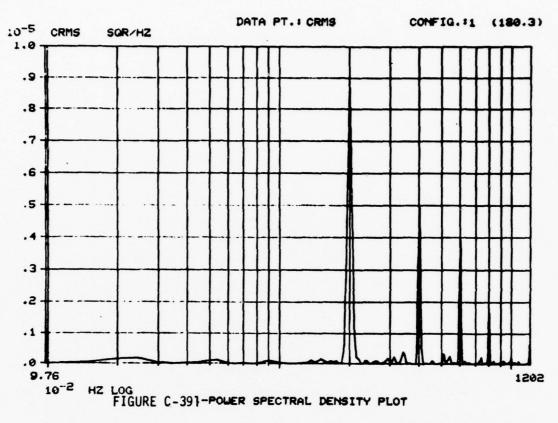


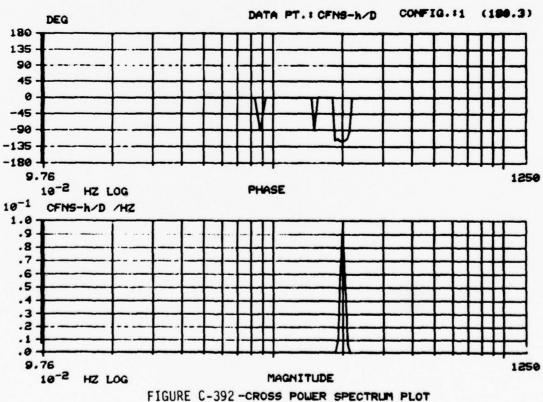


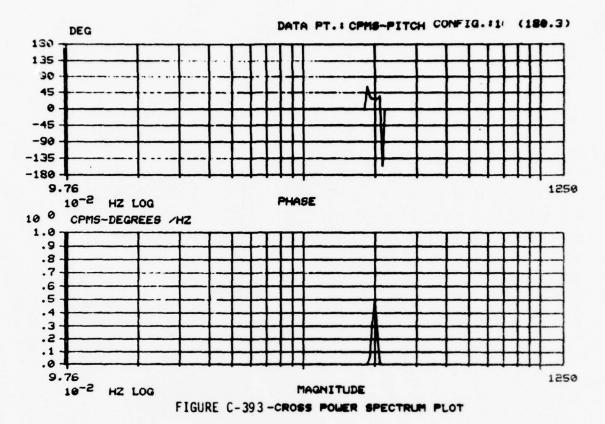












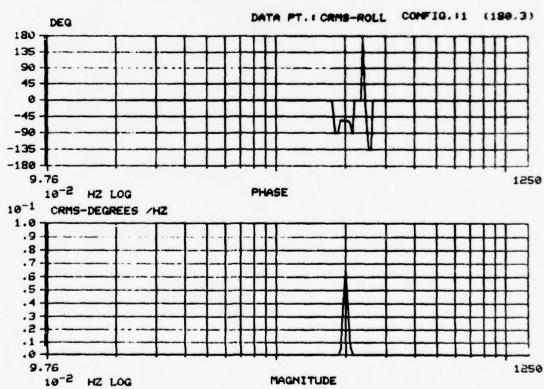
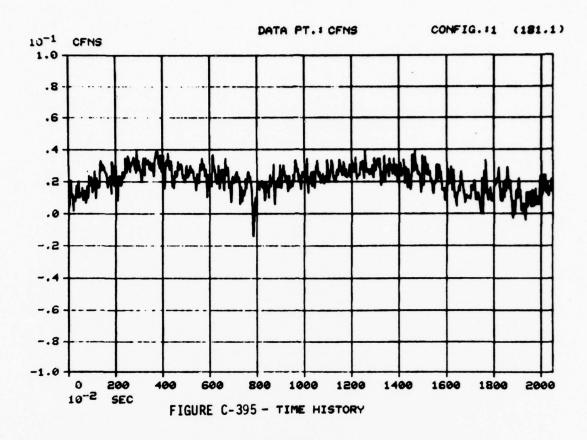
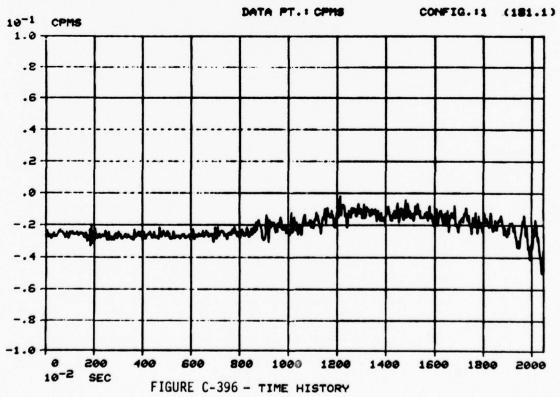
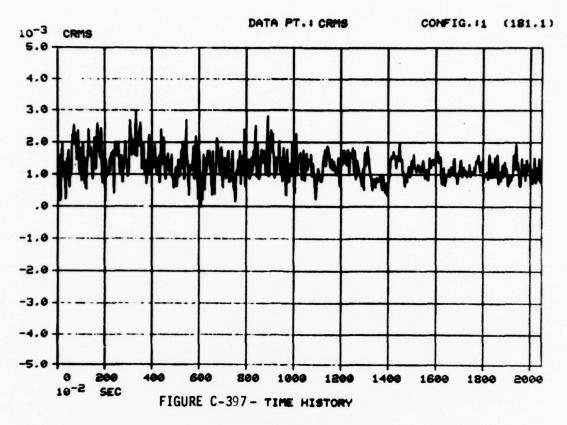
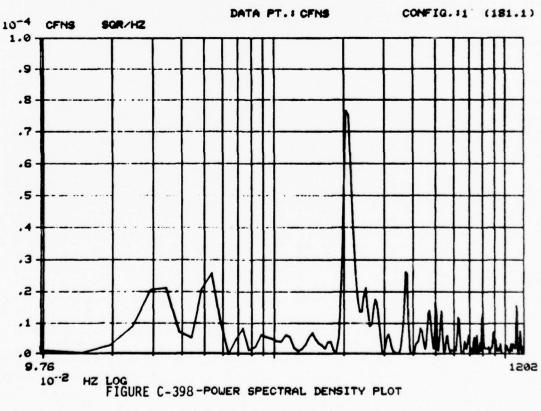


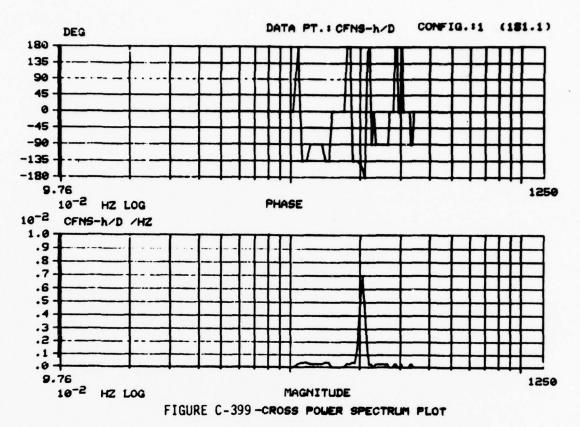
FIGURE C-394 -CROSS POWER SPECTRUM PLOT

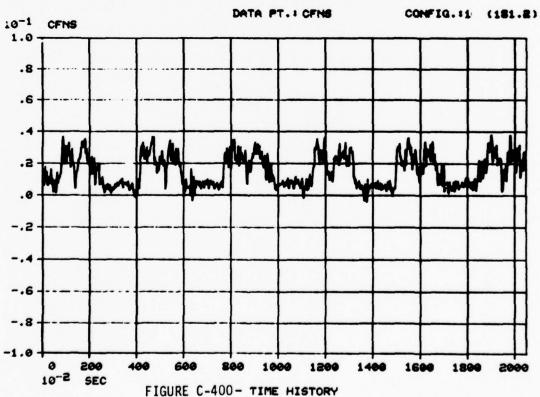


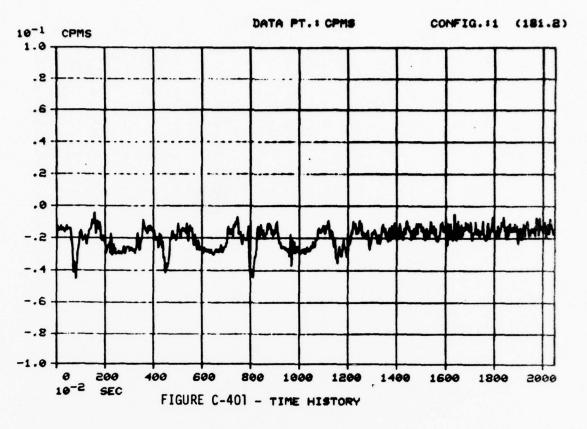


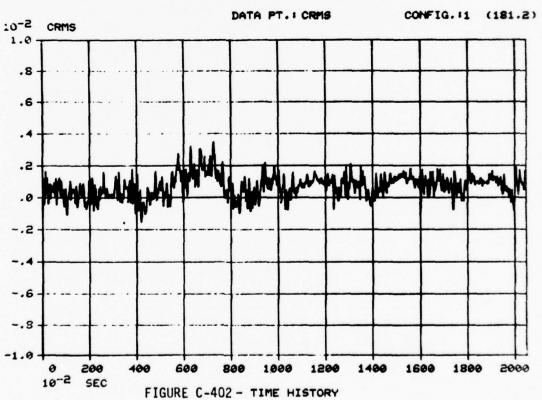


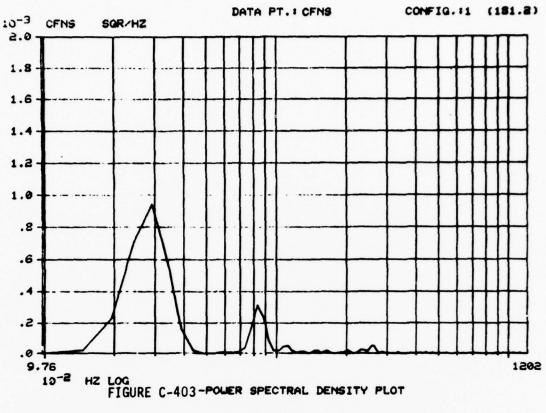


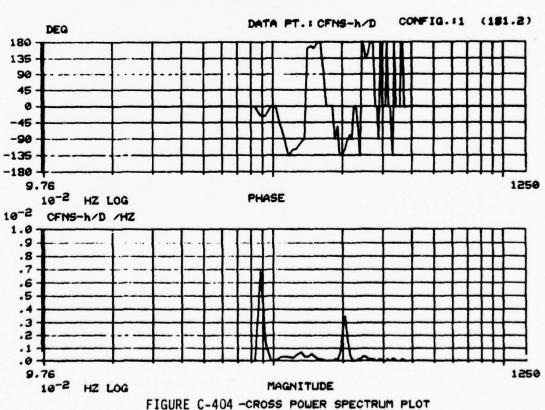


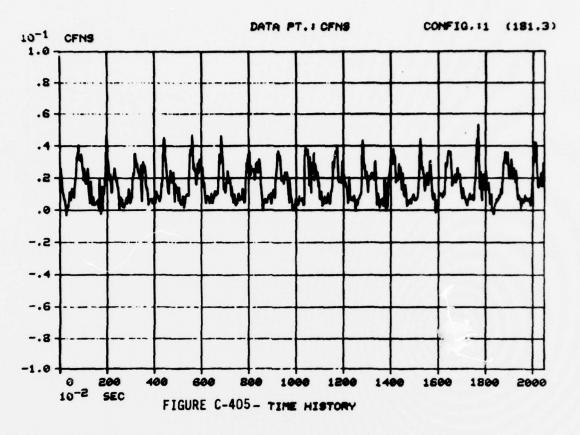


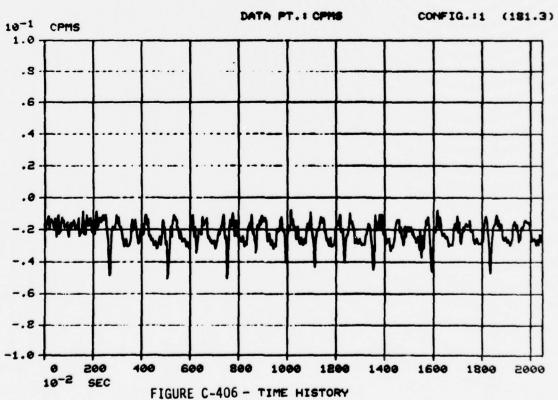


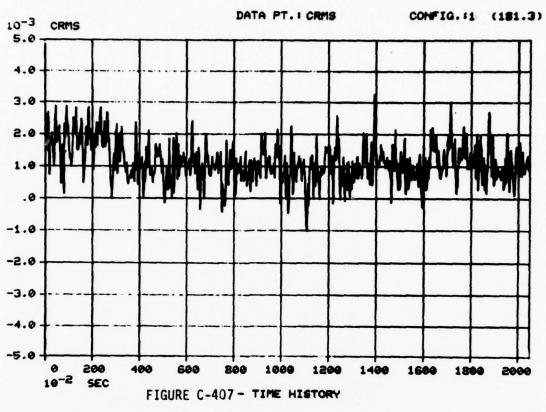


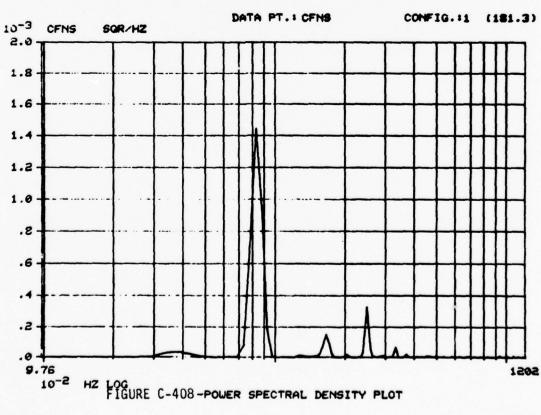


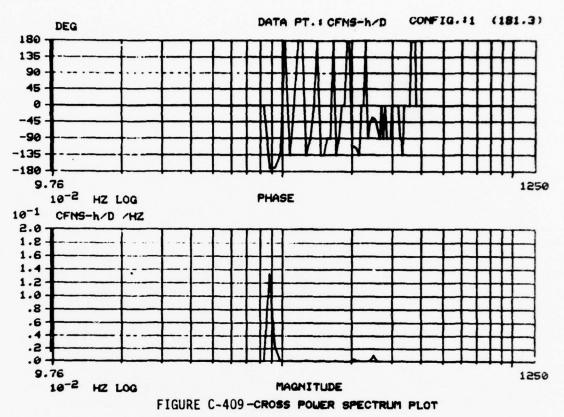


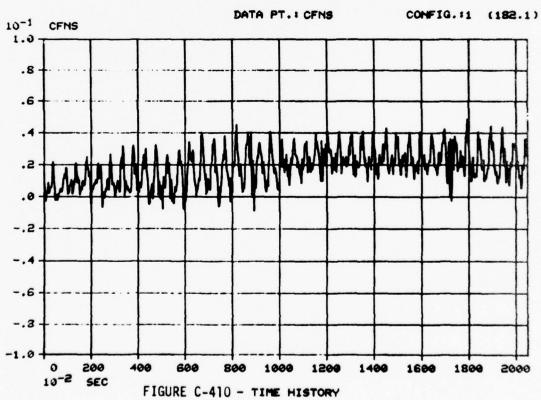


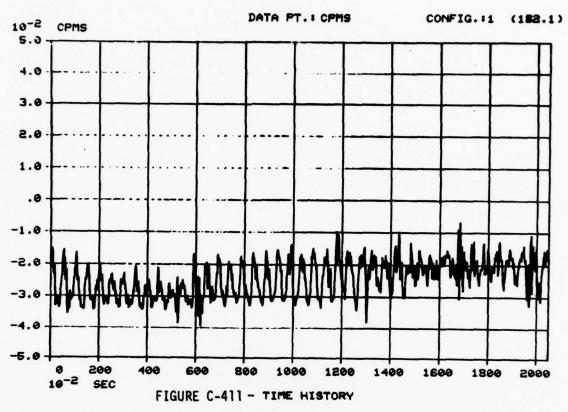


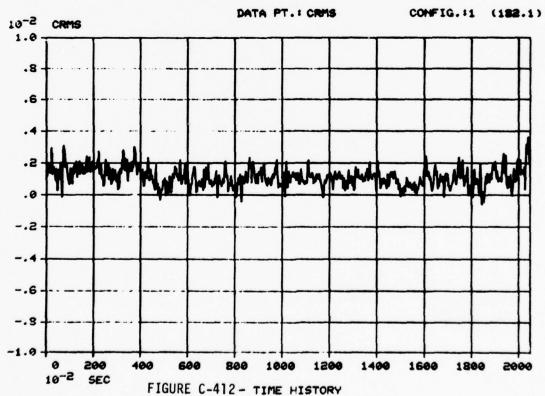


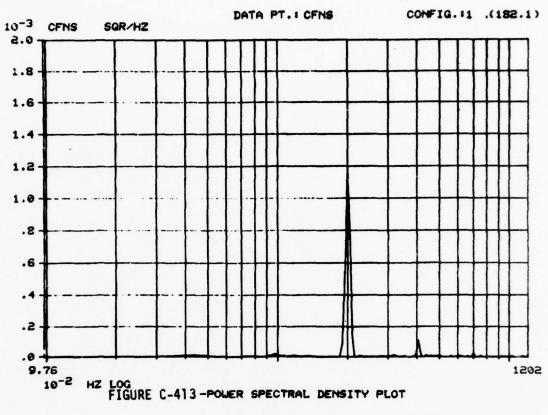


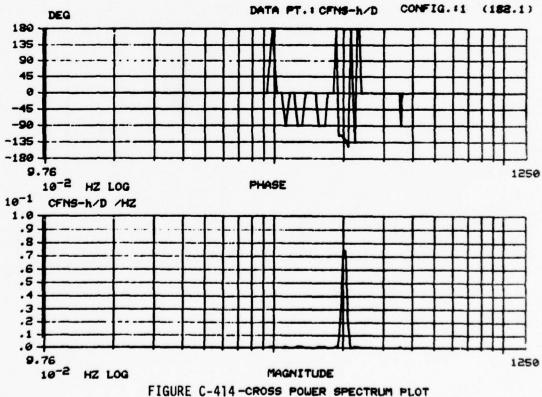


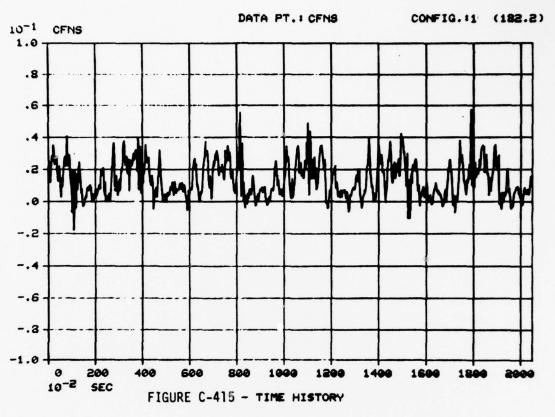


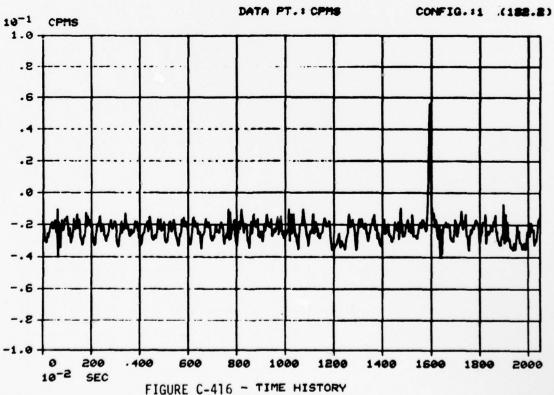


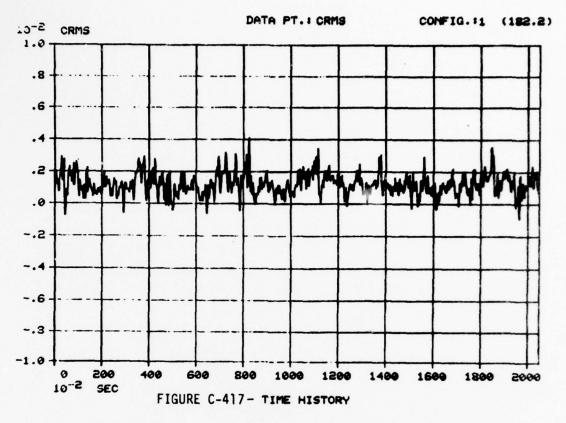


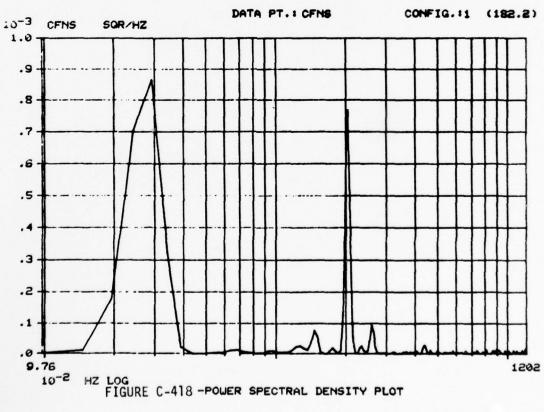


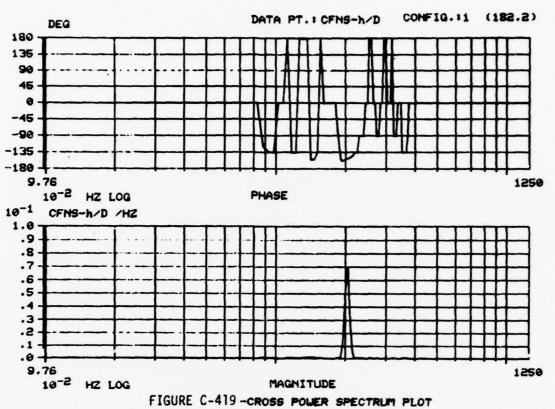




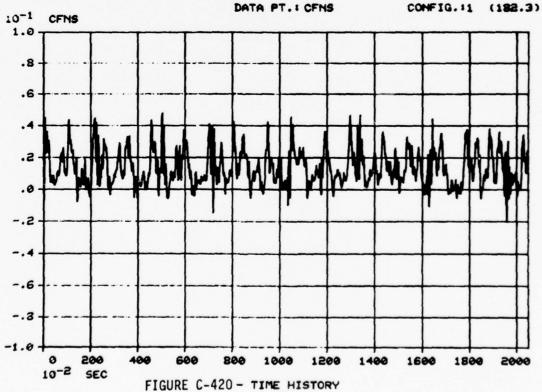


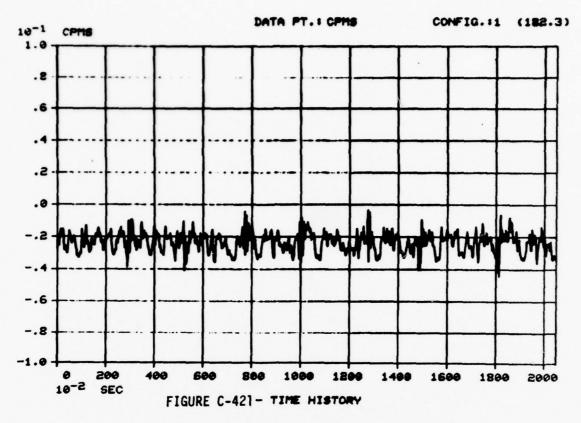


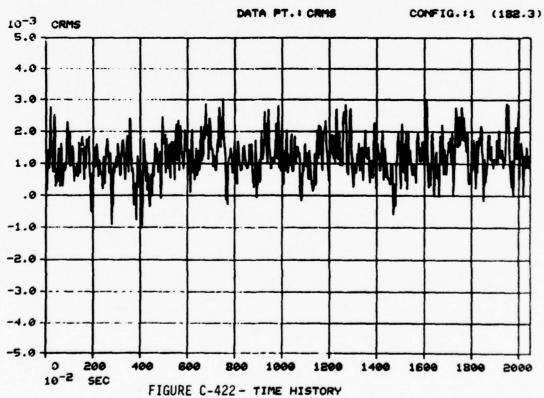


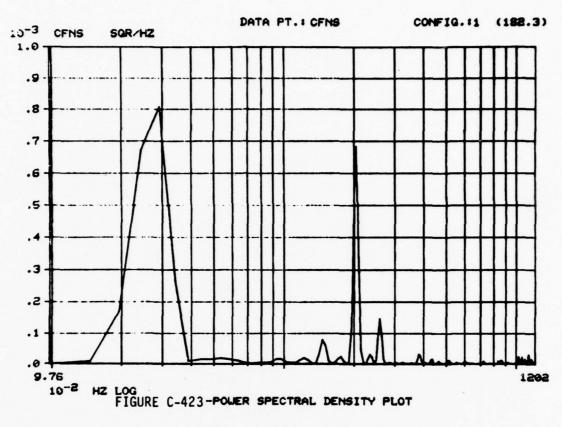


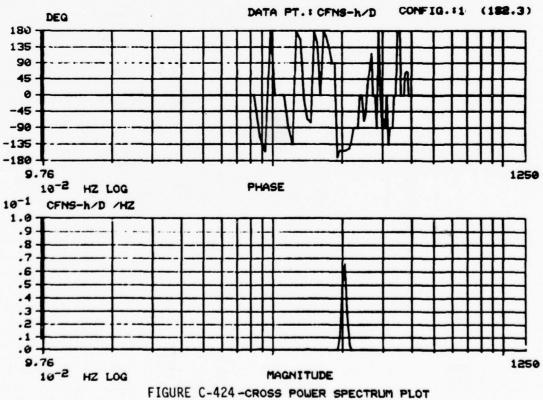
DATA PT.: CFNS CONFIG.

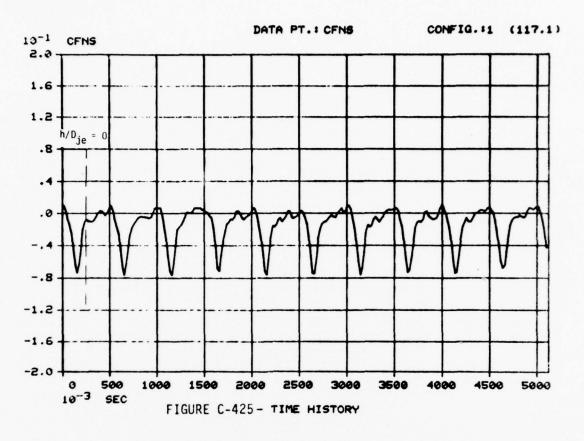


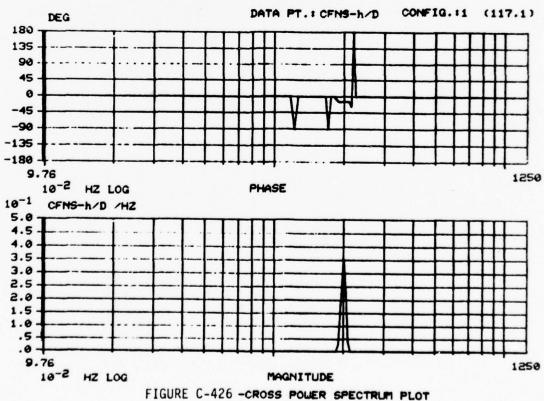


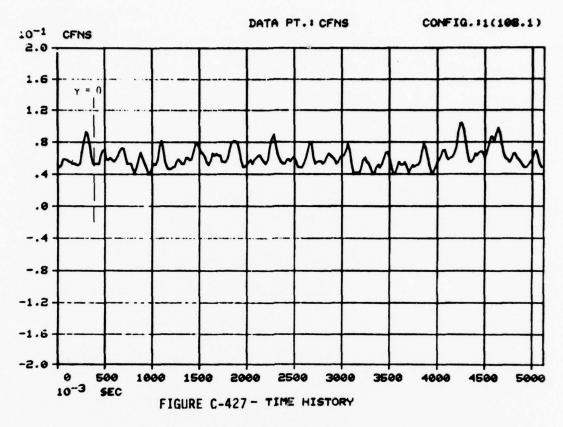


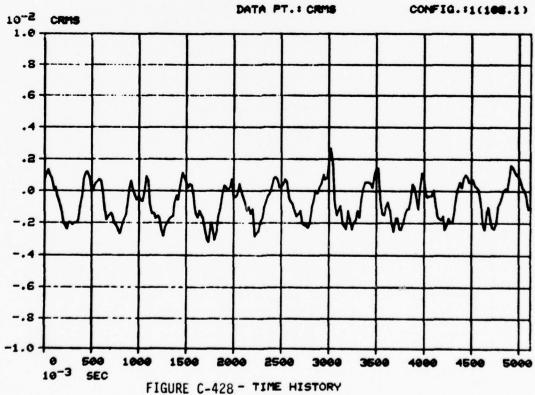


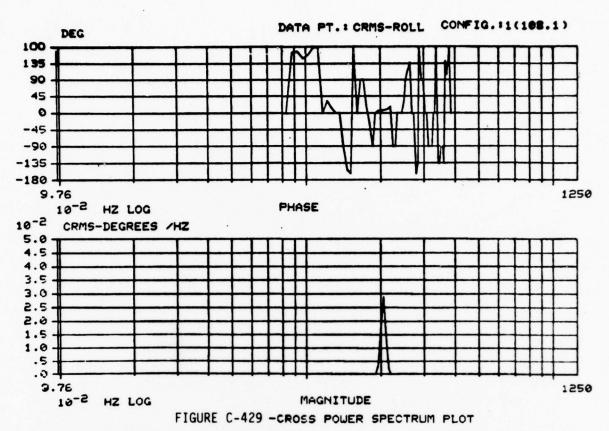


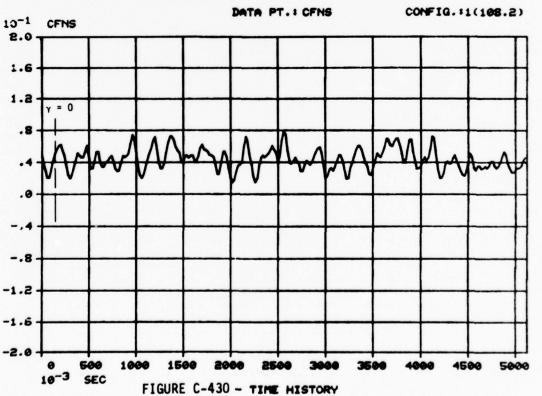












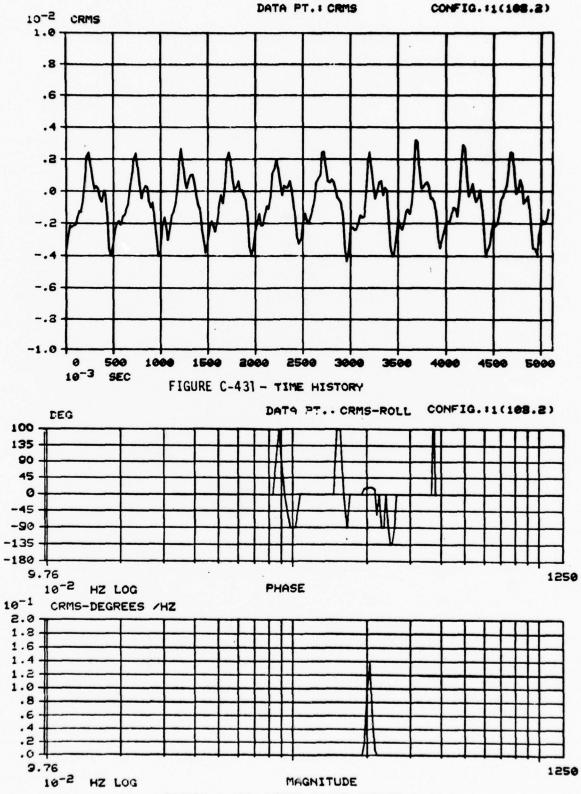
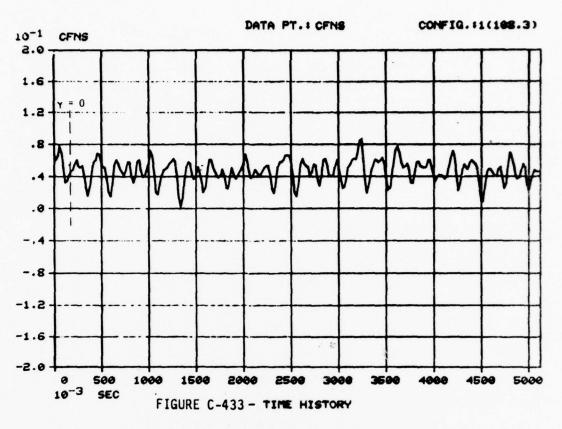
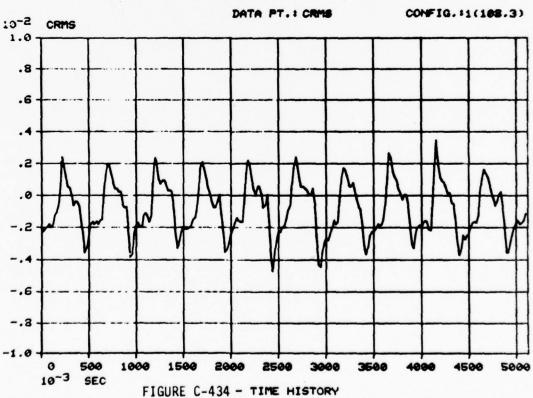
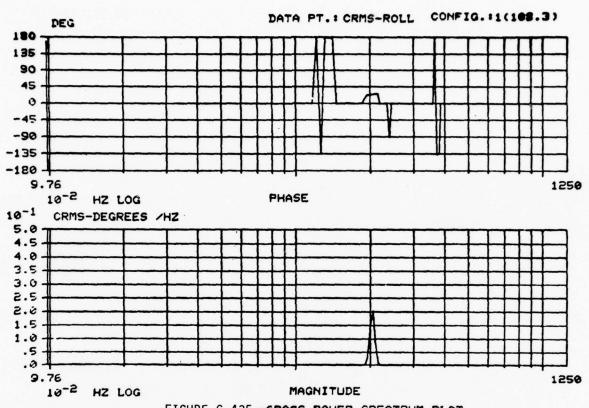
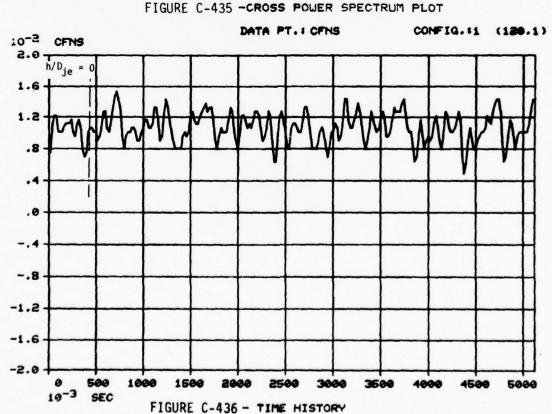


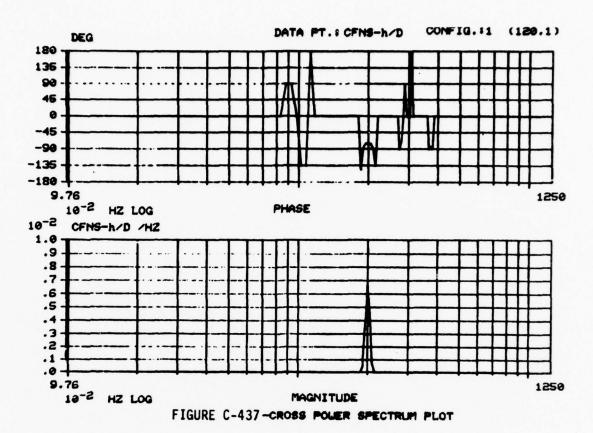
FIGURE C-432 -CROSS POWER SPECTRUM PLOT

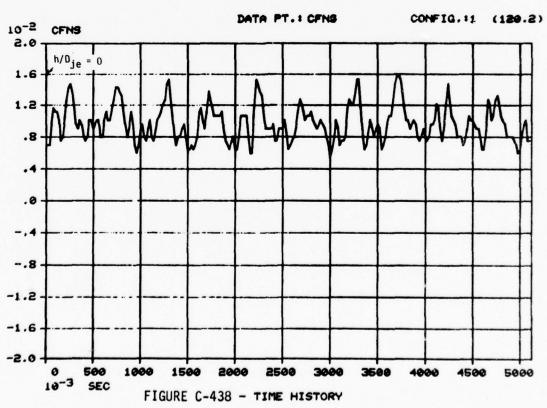


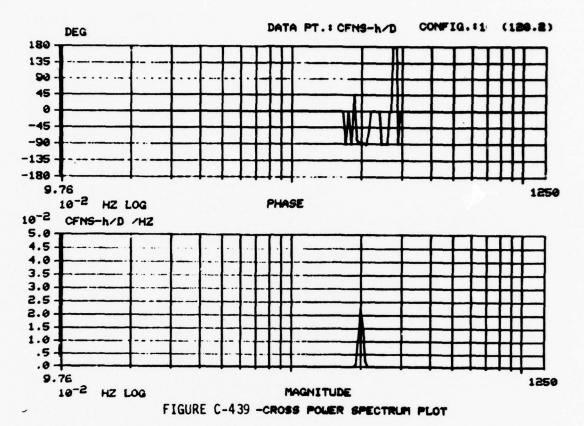




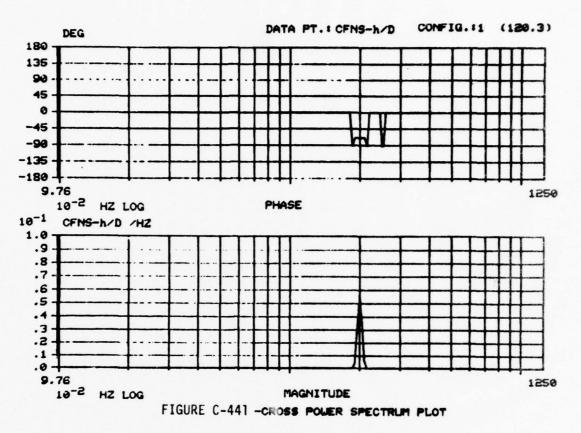


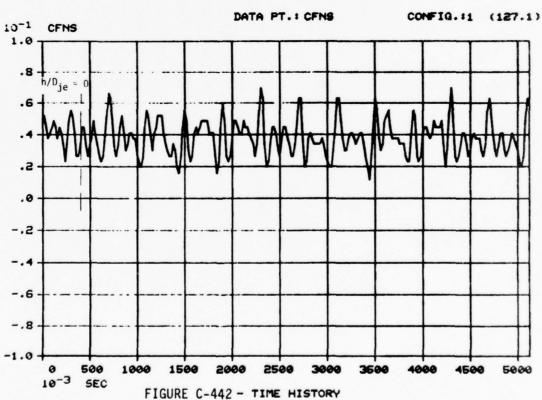


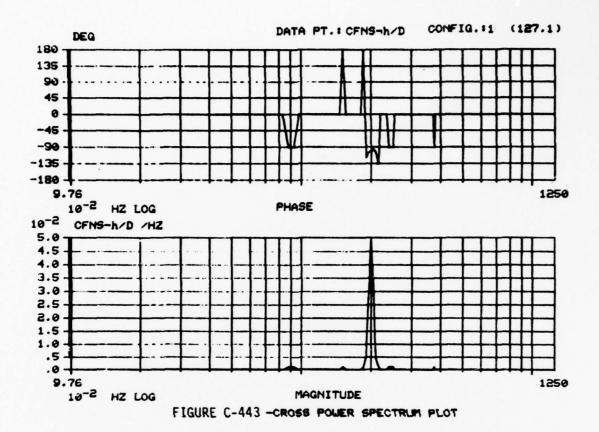


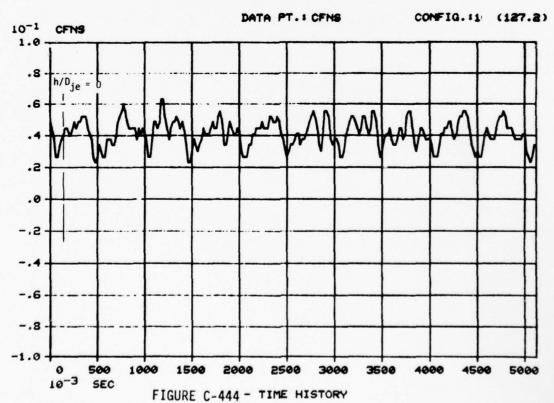


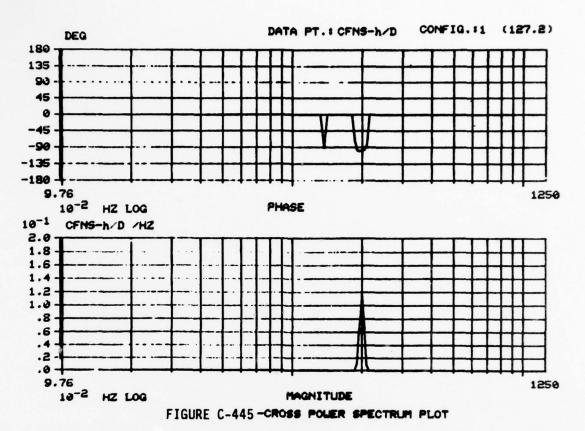
CONFIG. :1 (129.3) DATA PT.: CFNS 10-5 CENS 5.0 -4.0 +  $h/D_{je} = 0$ 3.0 # 2.0 1.0 .0 -1.0 -2.0 -3.0 -4.0 -5.0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-440 - TIME HISTORY

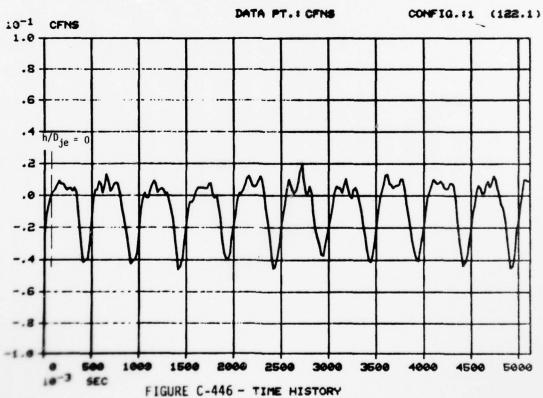


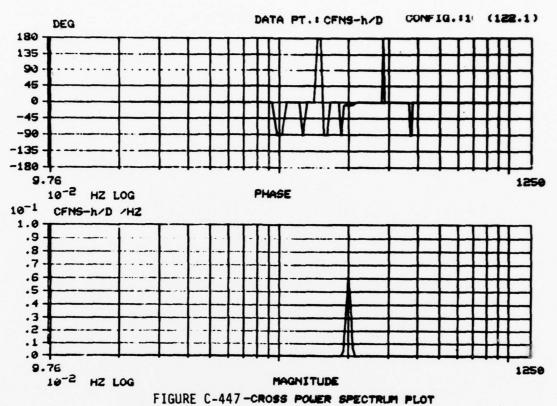


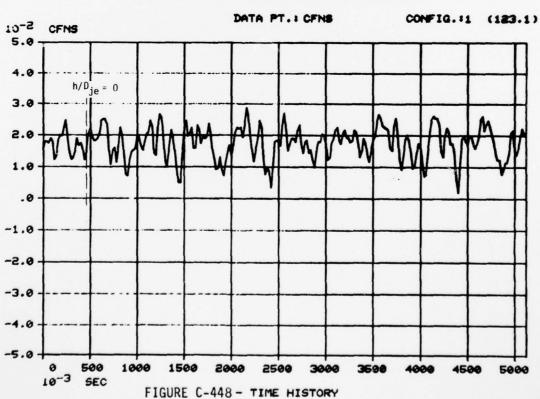


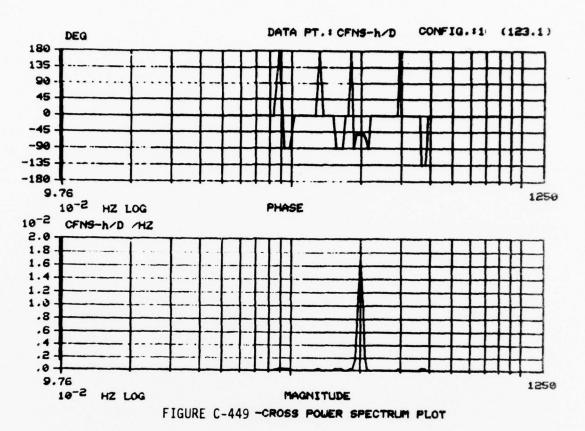


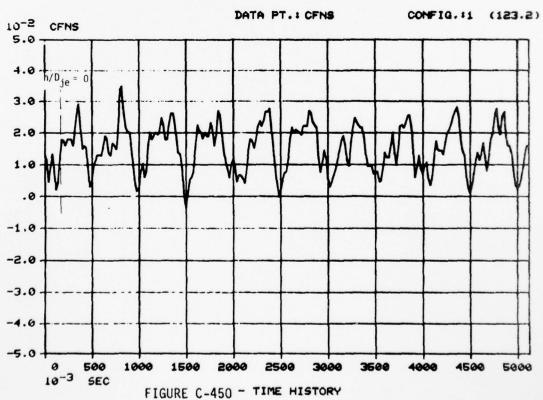


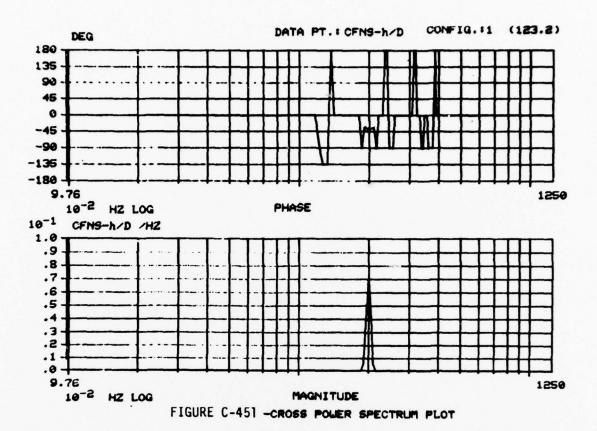












DATA PT.: CFNS CONFIG. 11 (123.3) 10-1 CFNS 1.0 .8 .6 - $/h/D_{je} = 0$ .2 .0 -.2 -.6 -.8 -1.0+ 1500 2000 2500 3500 4000 500 10-3 SEC

FIGURE C-452 - TIME HISTORY

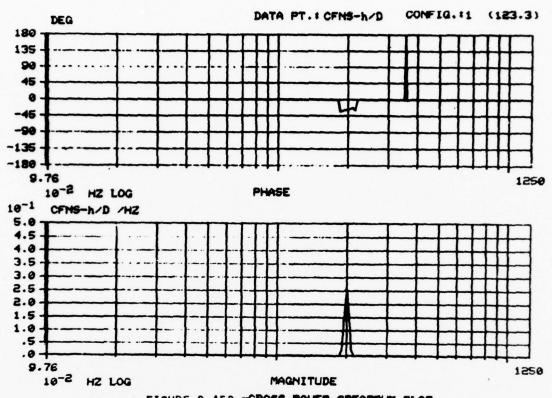
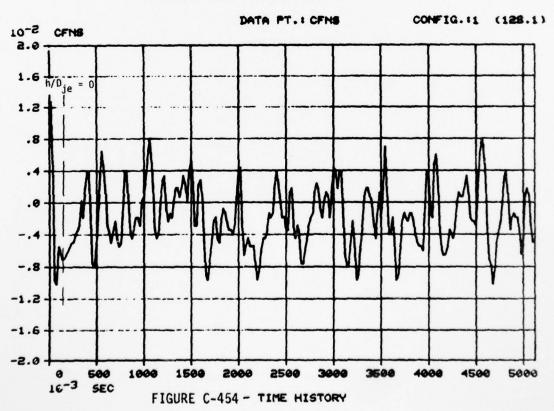
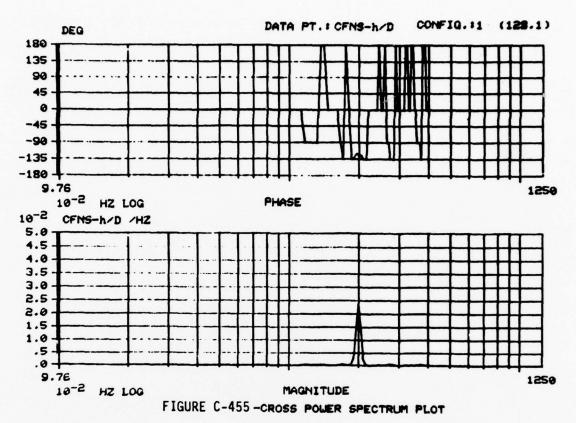
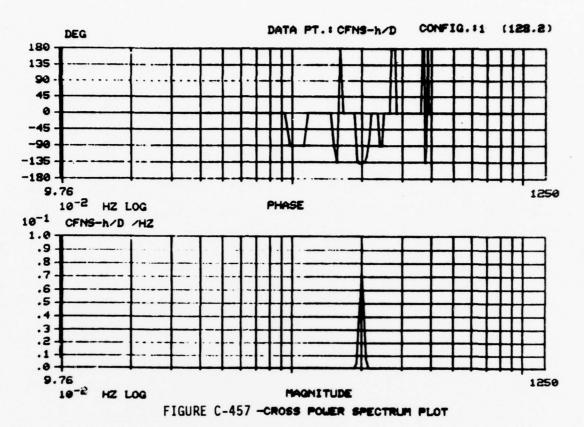


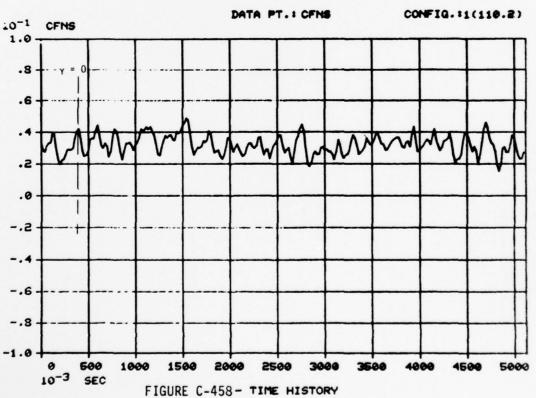
FIGURE C-453 -CROSS POWER SPECTRUM PLOT

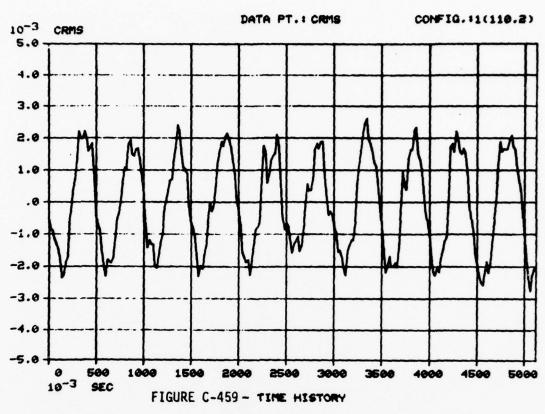


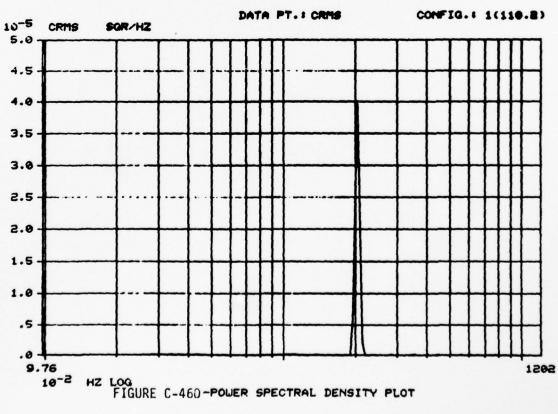


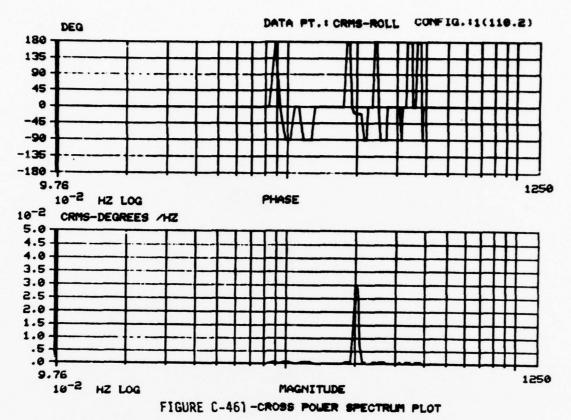
DATA PT. : CFNS CONFIG. #1 (128.2) 10-2 CFNS 5.0 4.0 3.0  $h/D_{je} = 0$ 8.9 1.0 .0 -1.0 -2.0 -3.0 -4.0 -5.0 500 1000 1500 2000 2500 3000 3600 4000 4500 5000 0 10-3 SEC FIGURE C-456 - TIME HISTORY

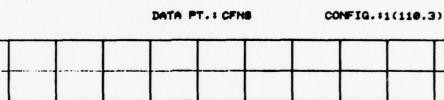








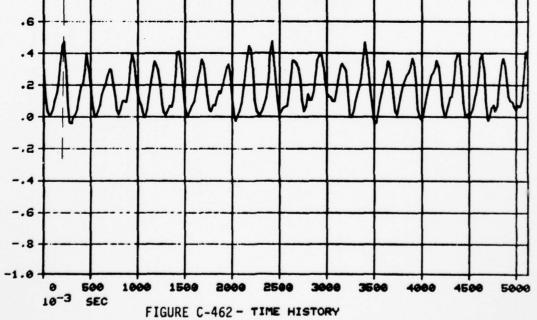


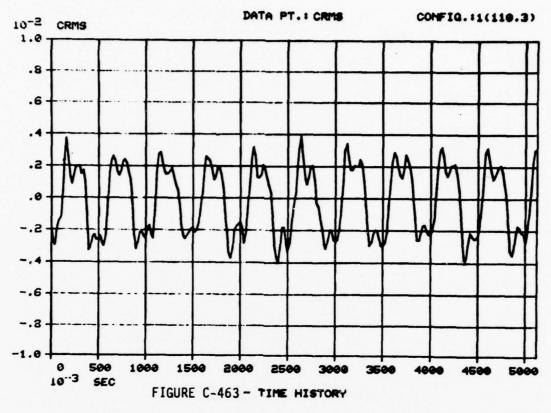


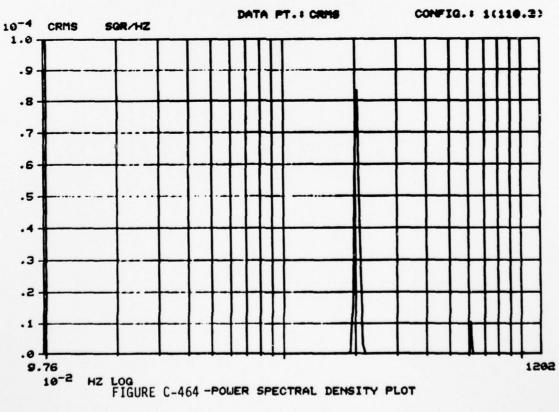
10-1 CFNS

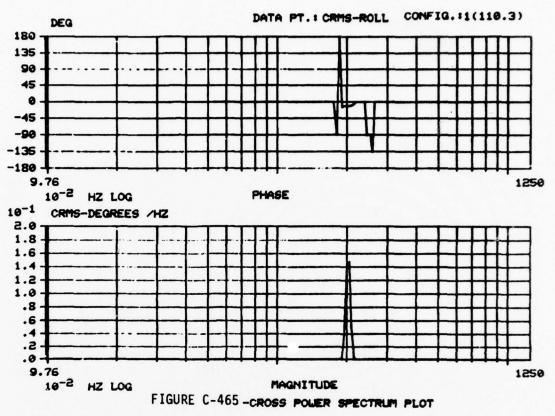
.8

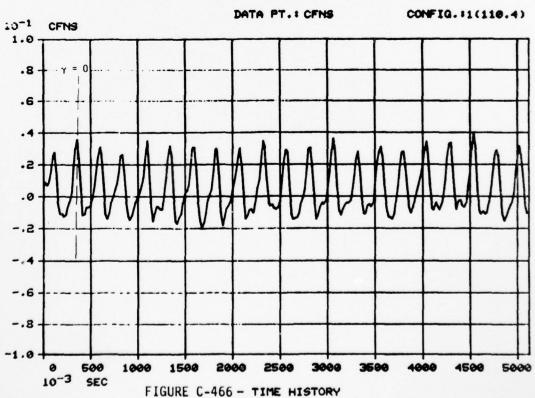
 $\gamma = 0$ 

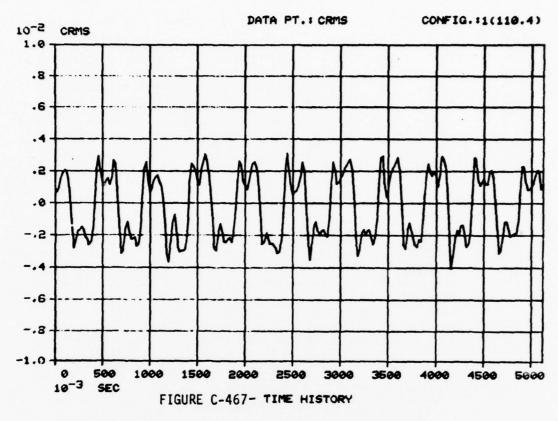


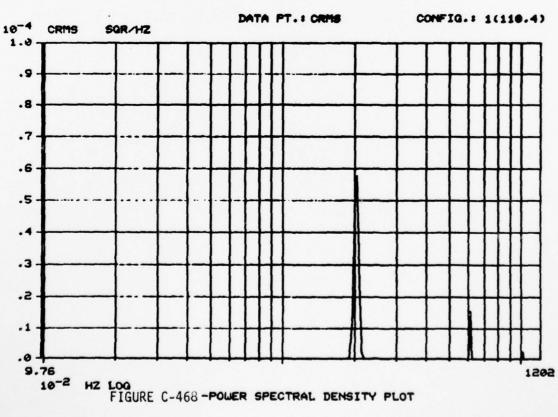


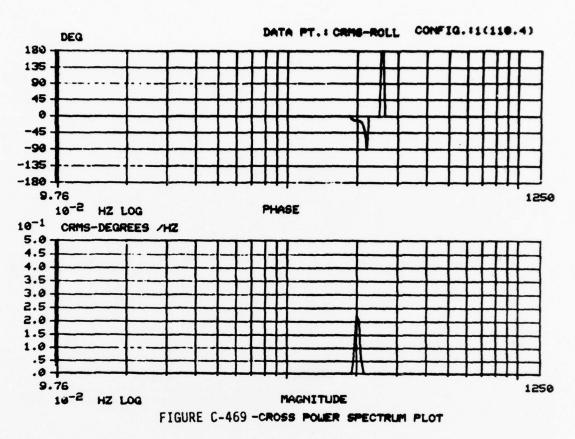


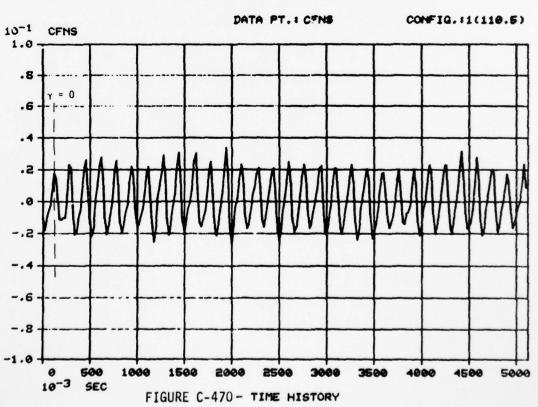


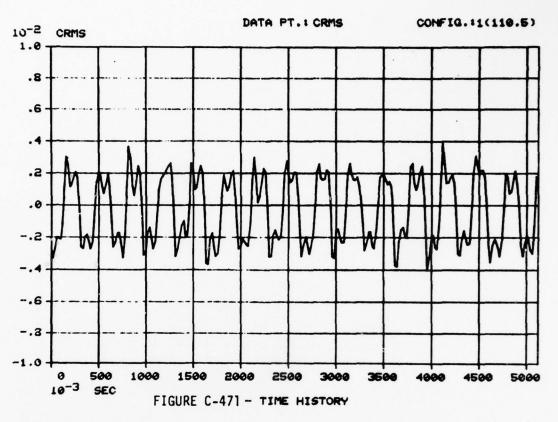


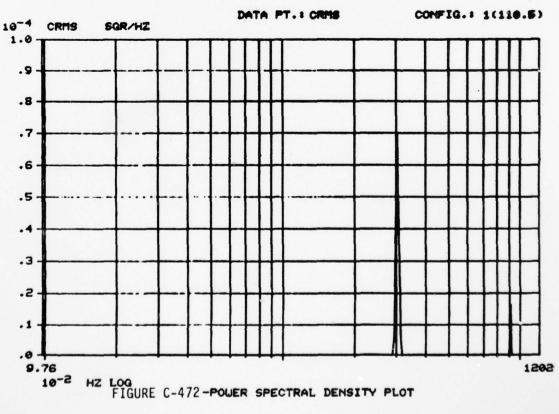


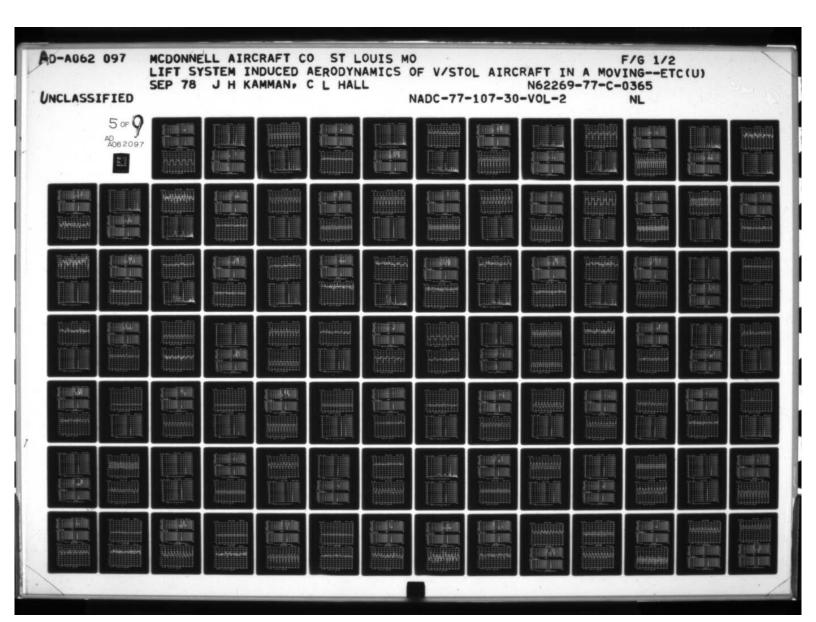




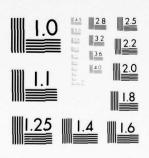




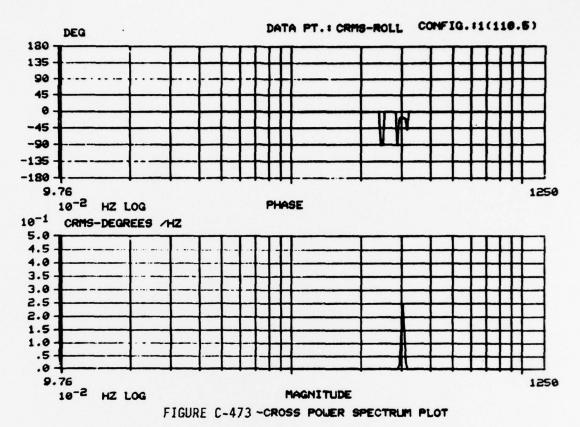


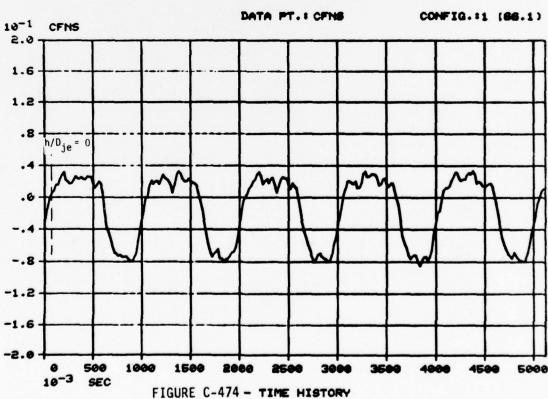


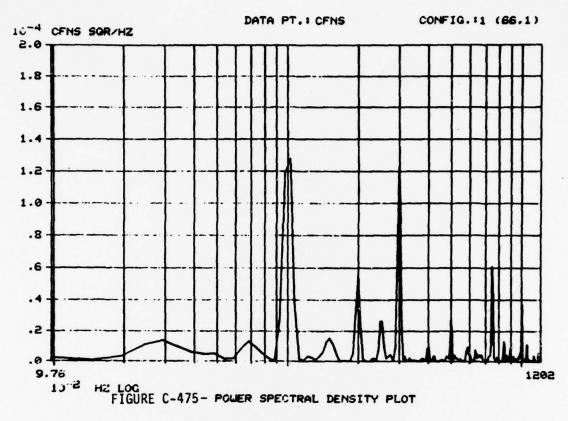
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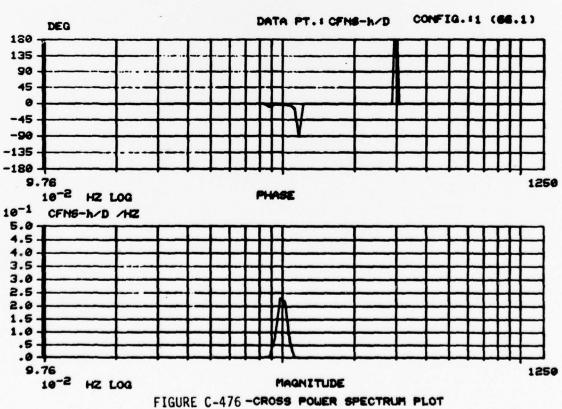


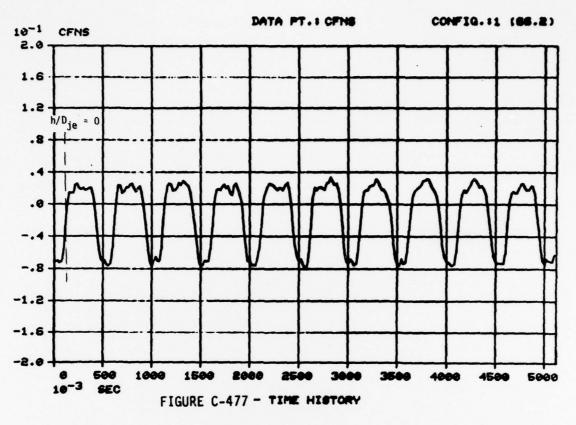
MICROCOPY RESOLUTION TEST CHART NATIONAL BUREAU OF STANDARDS-1963 A

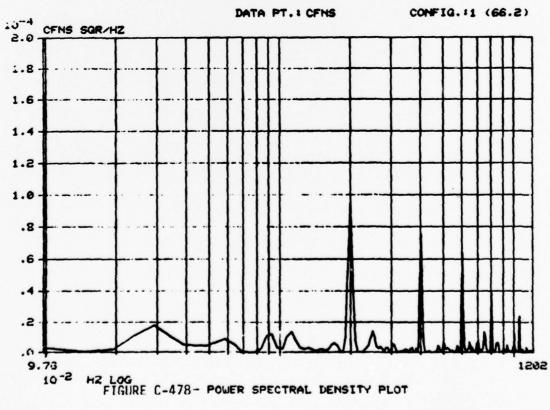


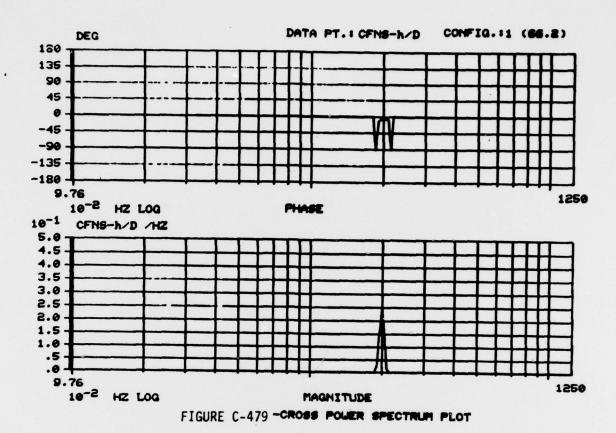


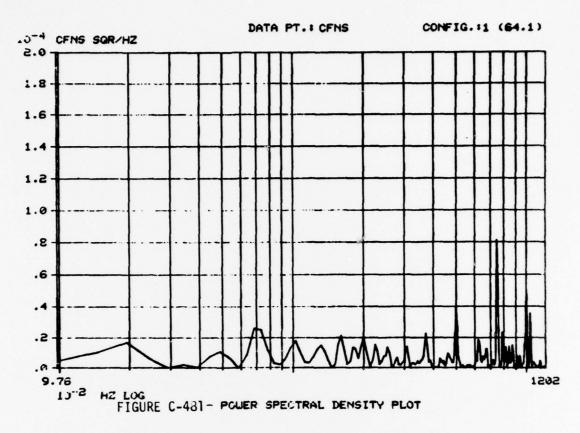


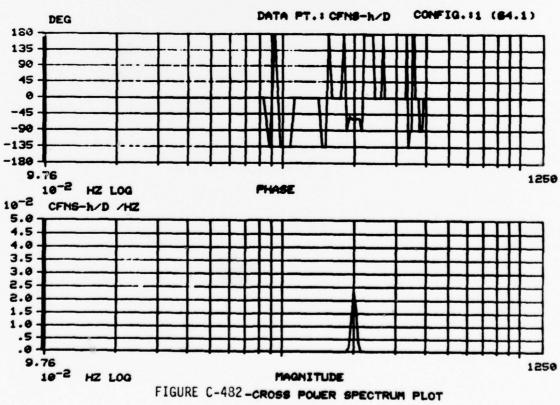


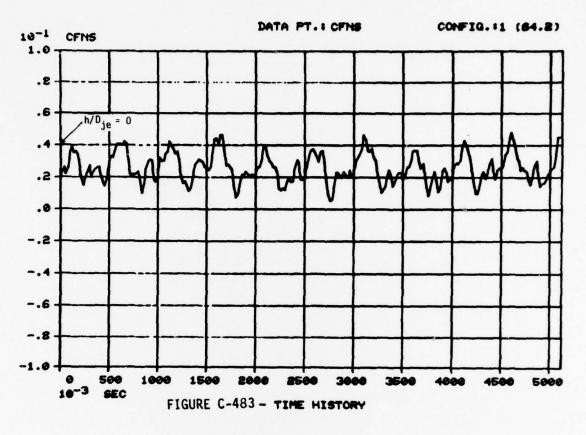


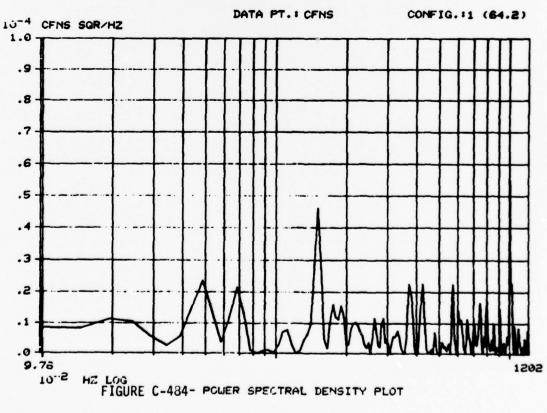


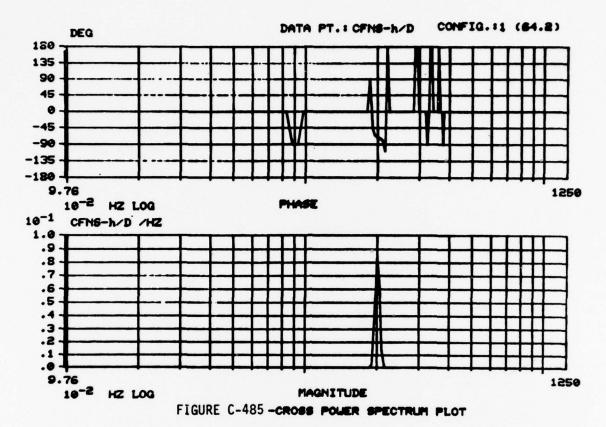


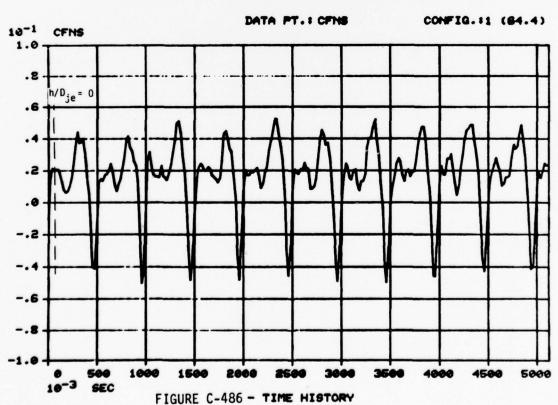


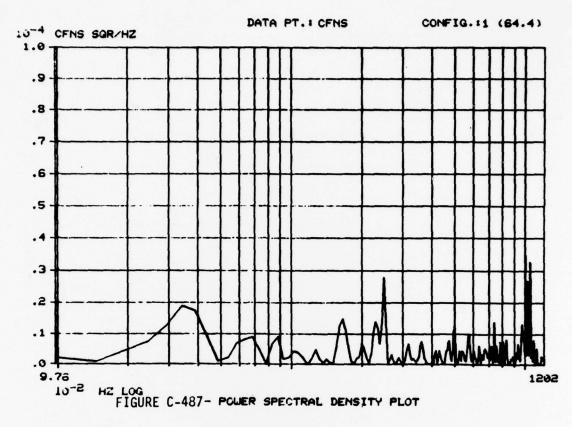


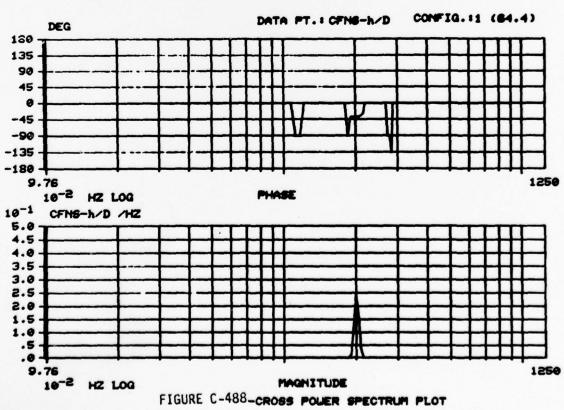


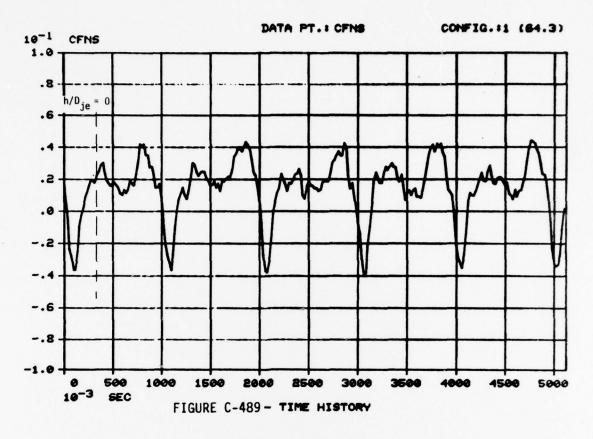


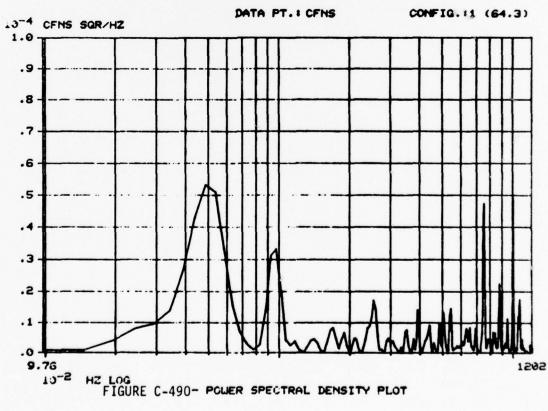


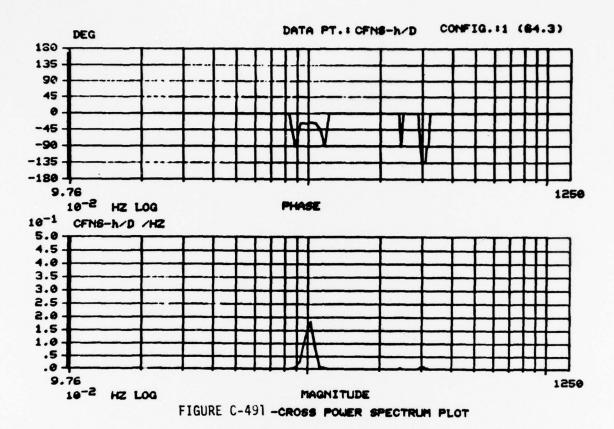


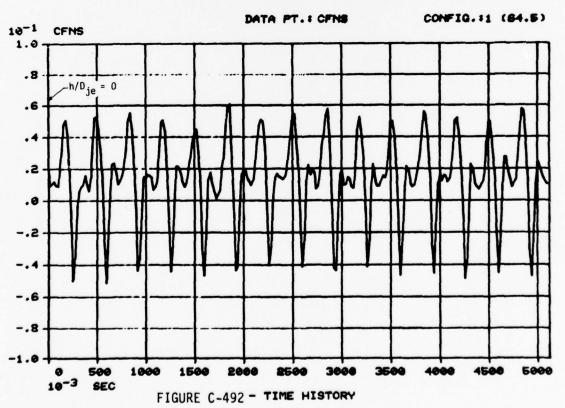


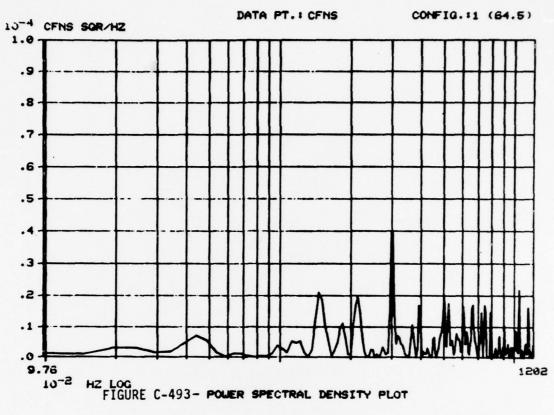


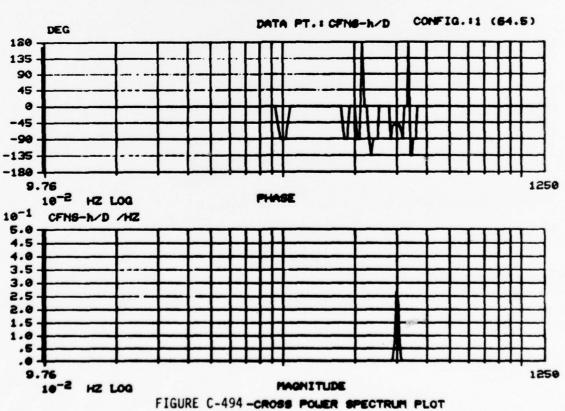


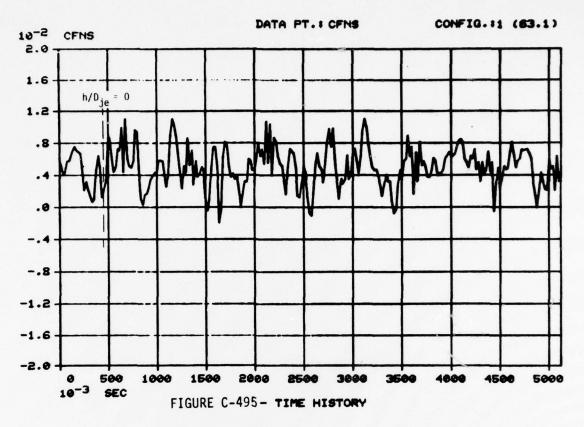


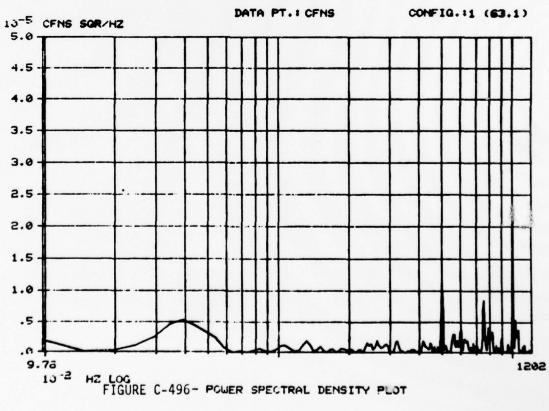


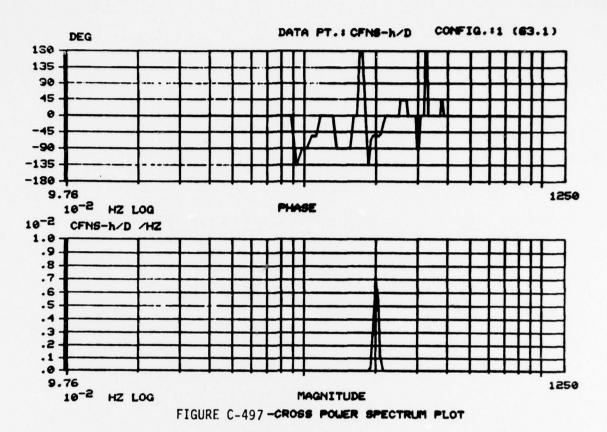


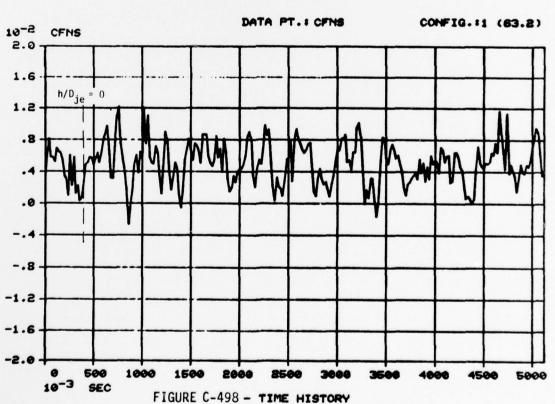


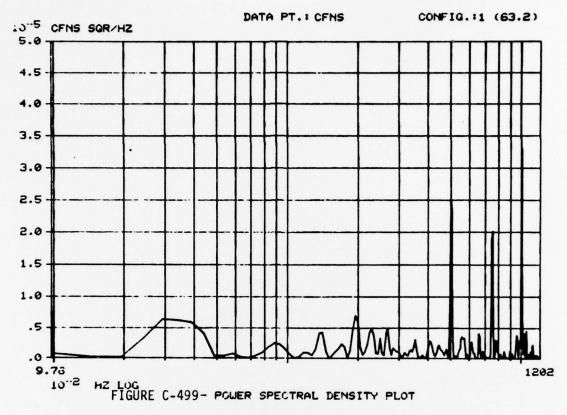


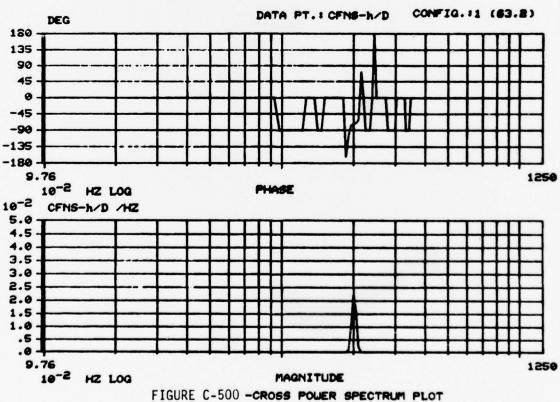


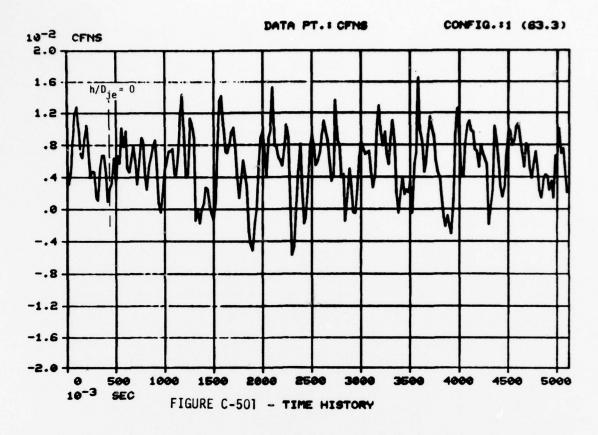


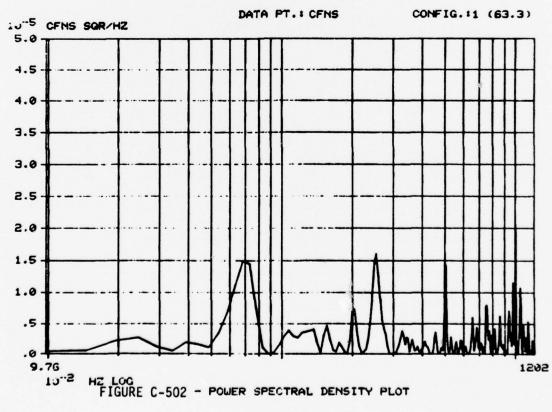


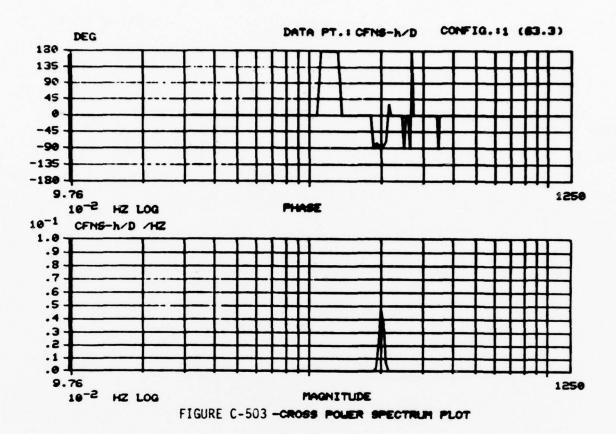




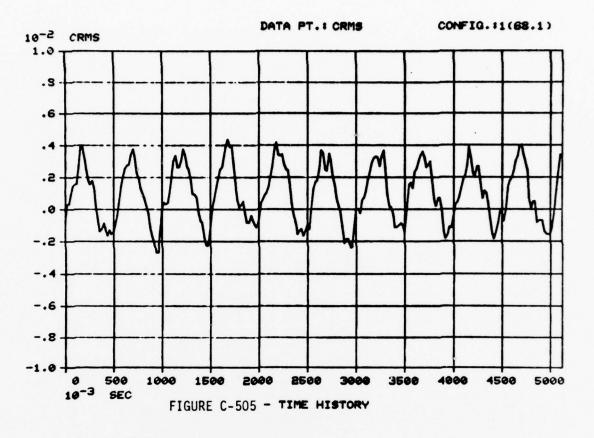


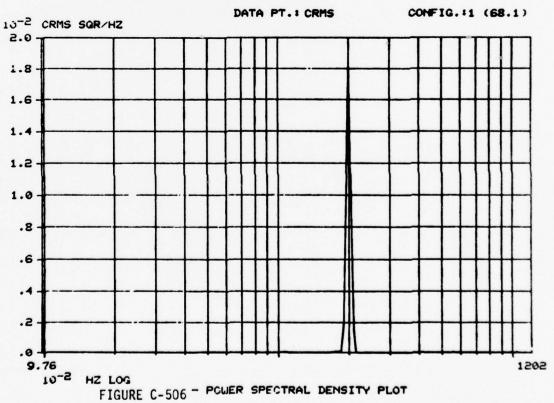


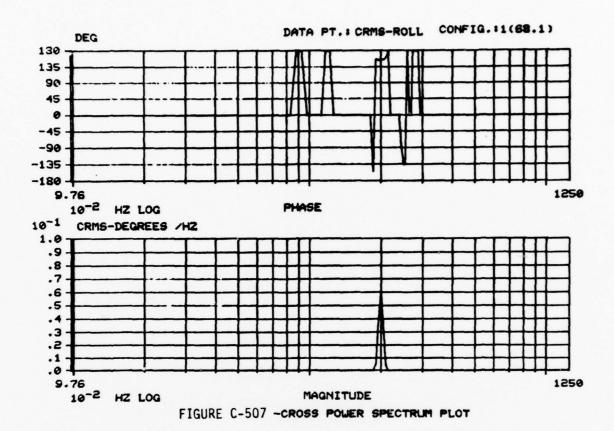


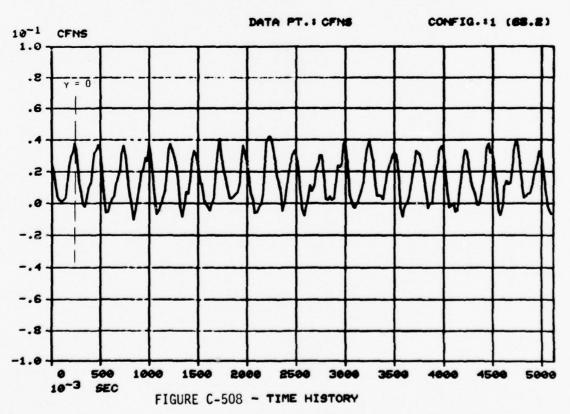


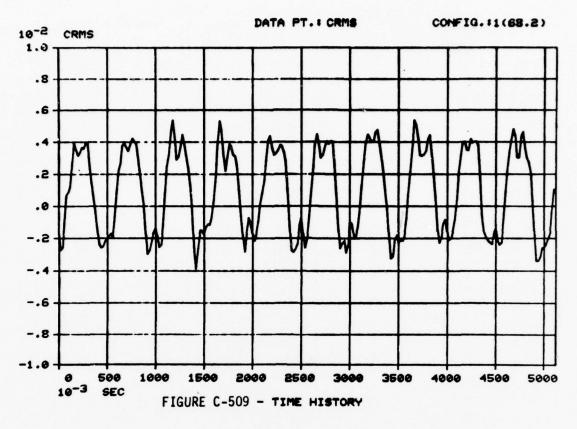
DATA PT.: CFNS CONFIG. 11 (88.1) 10-1 CFNS 1.0 1 = 0 .3 .6 .4 -.2 . 0 -.2 500 1000 1500 2000 2500 3600 10-3 SEC FIGURE C-504 - TIME HISTORY

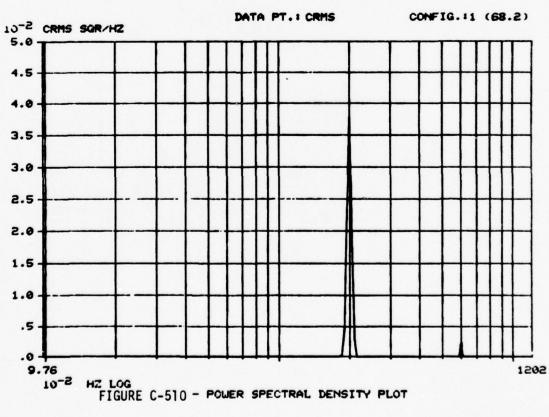


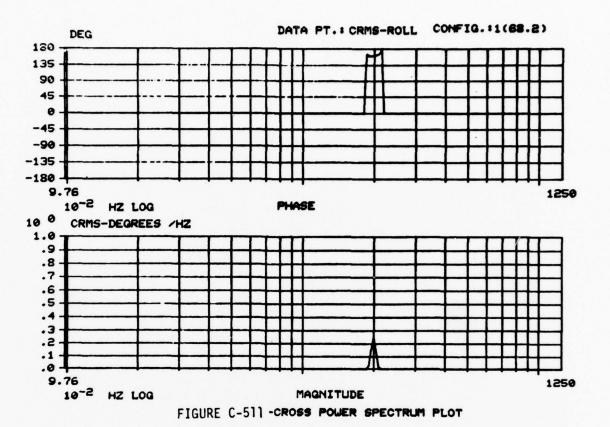




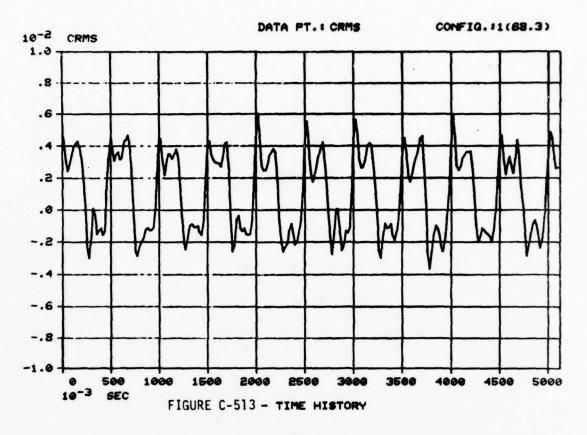


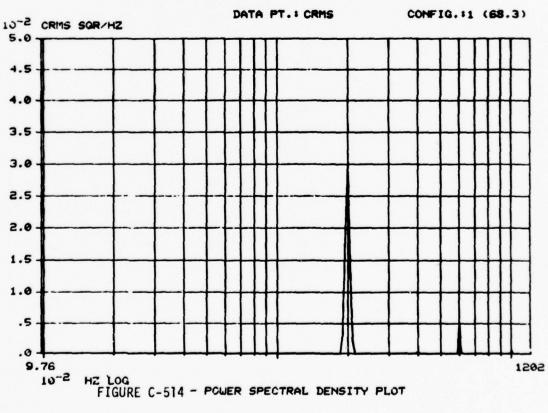


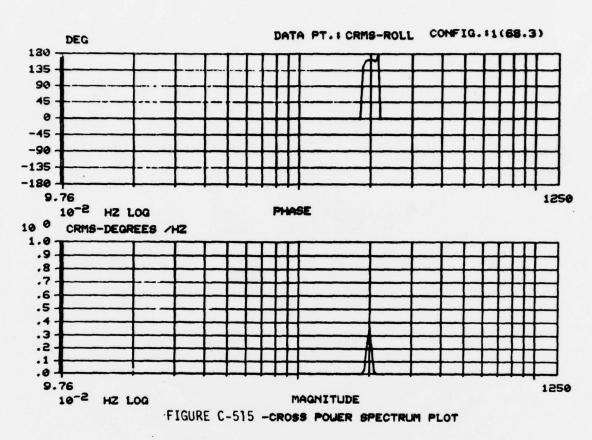


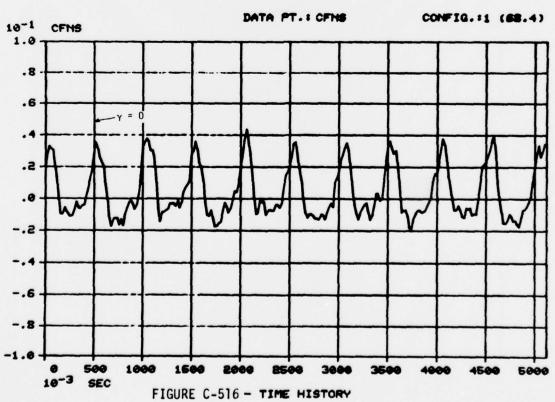


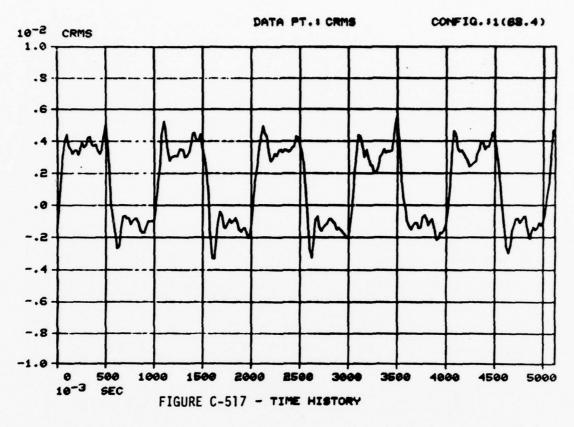
DATA PT. : CFNS CONFIG. #1 (68.3) 10-1 CFNS 1.0 .2 = 0 .6 .2 -.2 -.4 -.6 500 1000 1500 2000 2500 3500 4000 4500 10-3 SEC FIGURE C-512 - TIME HISTORY

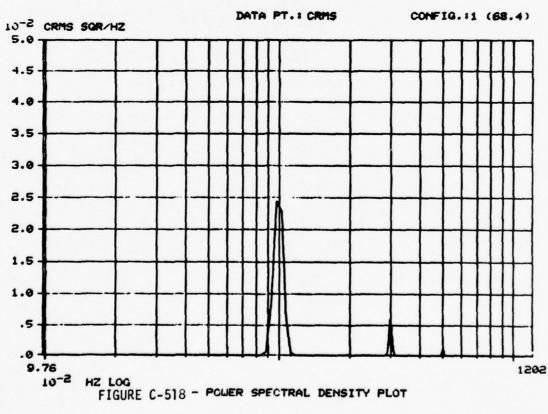


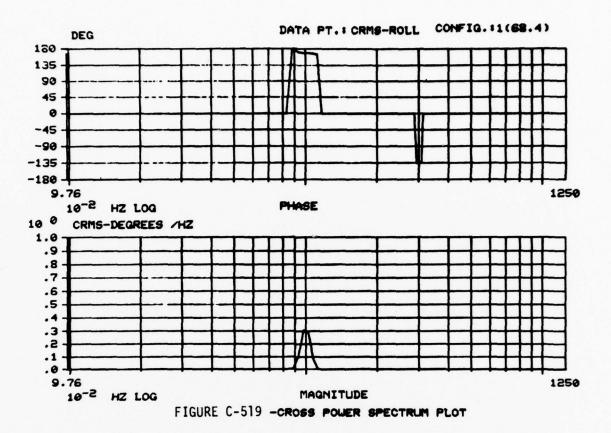


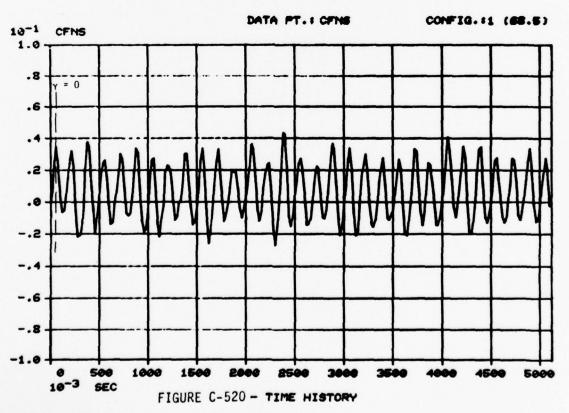


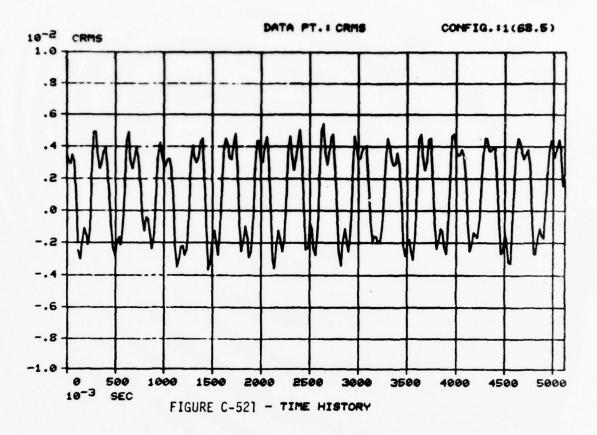


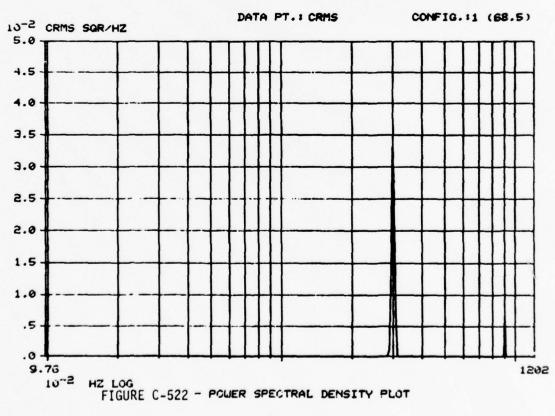


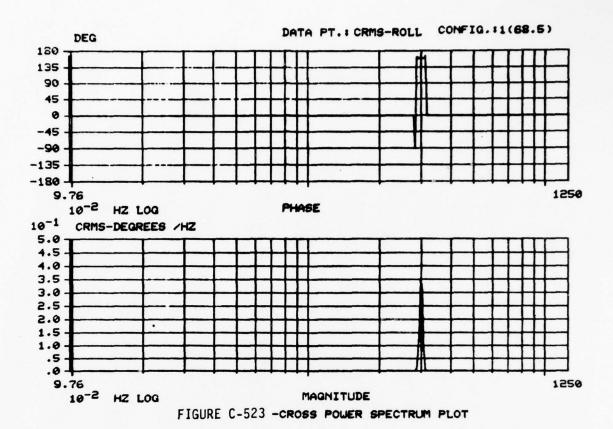


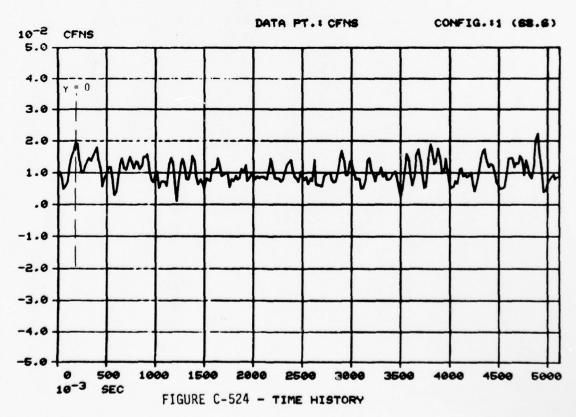


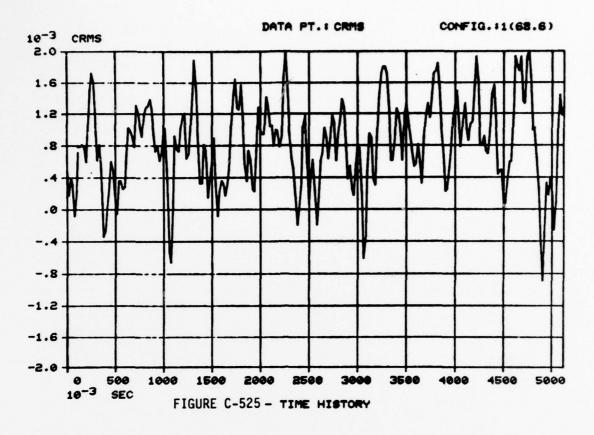


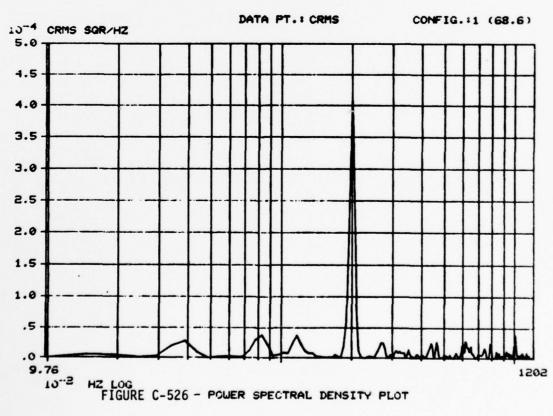


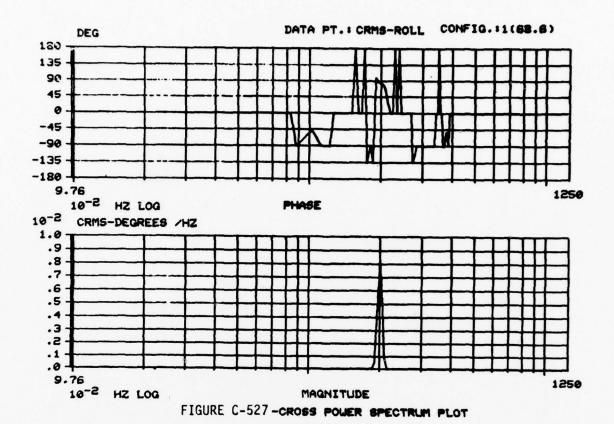


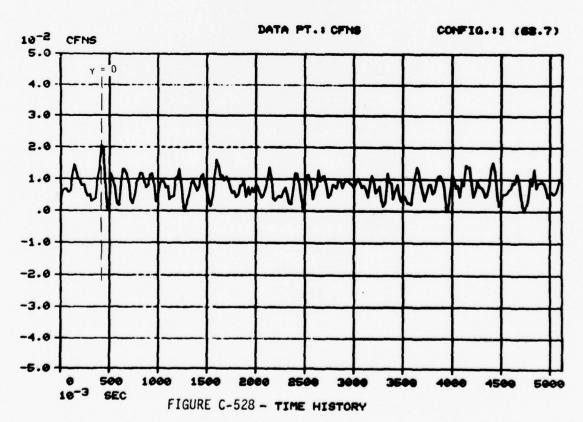


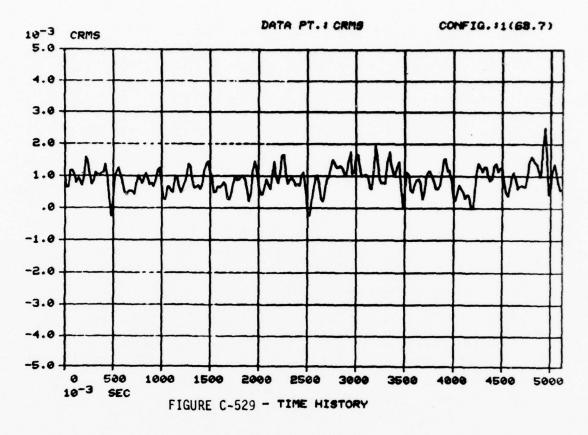


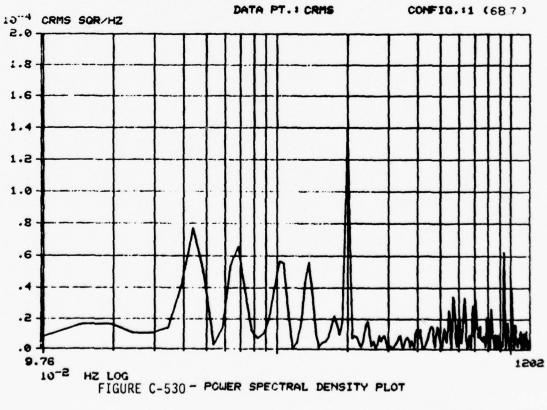


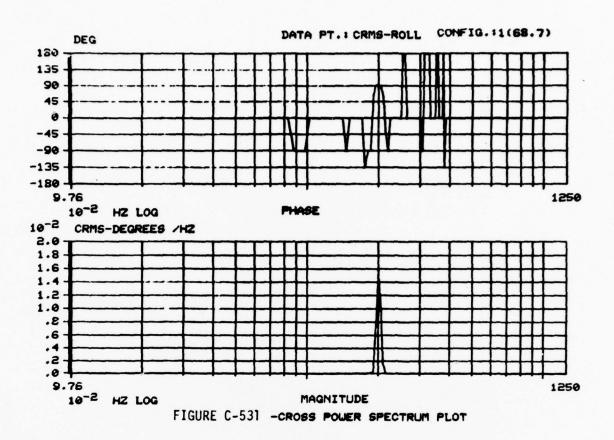


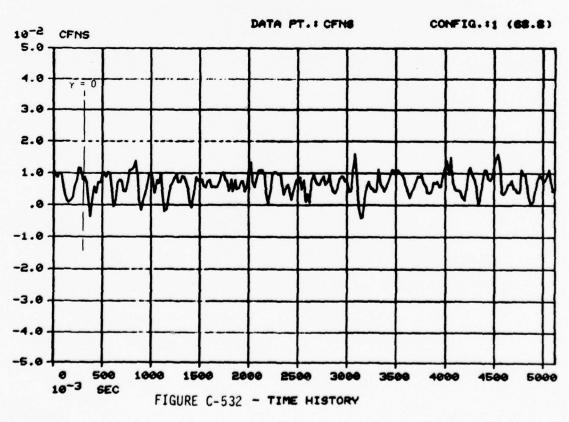


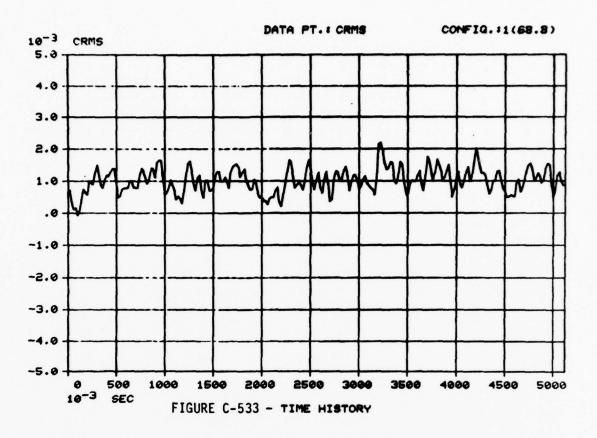


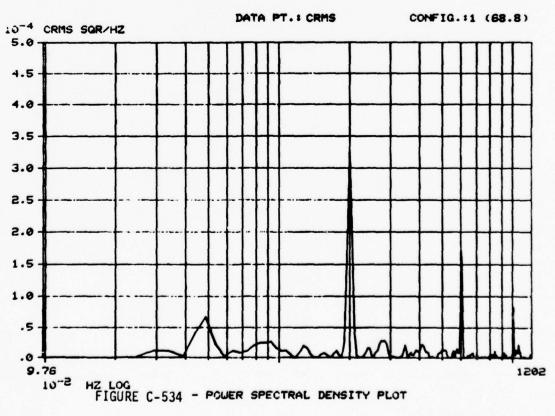


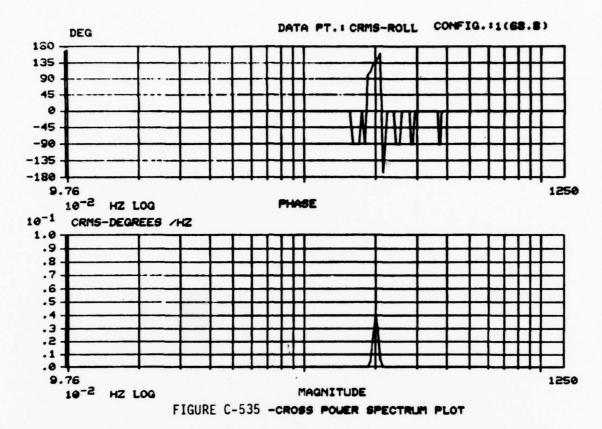


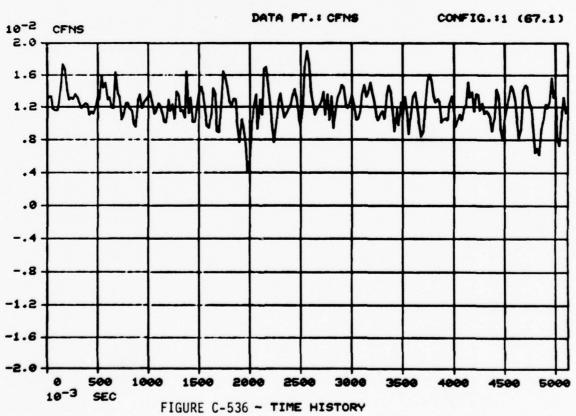


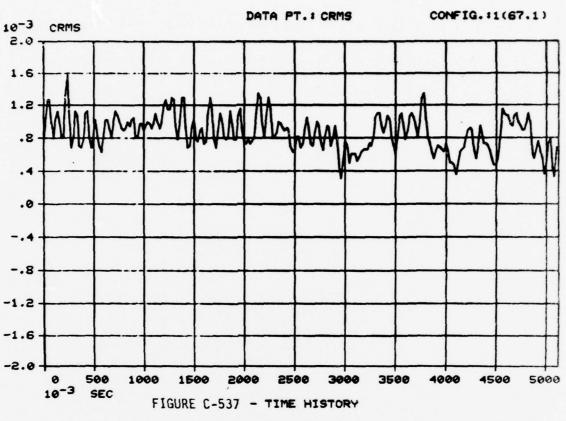


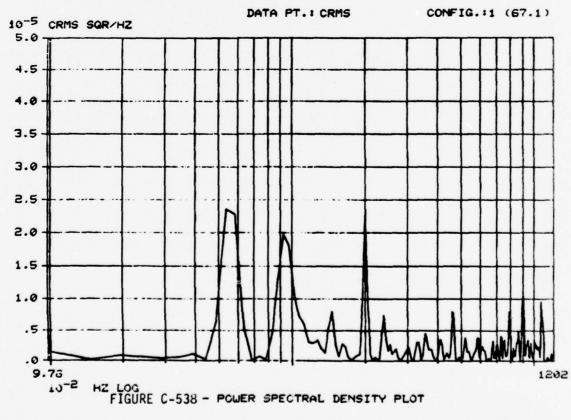


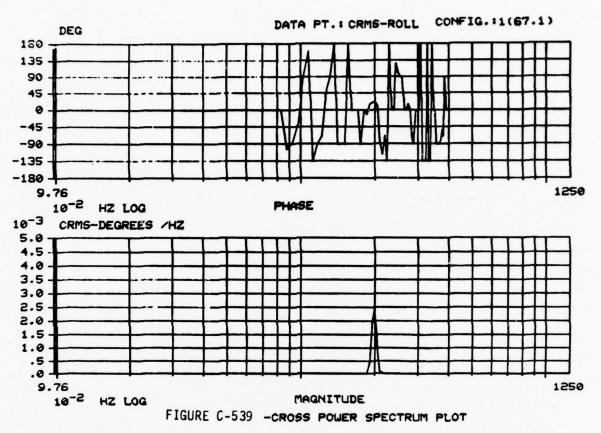


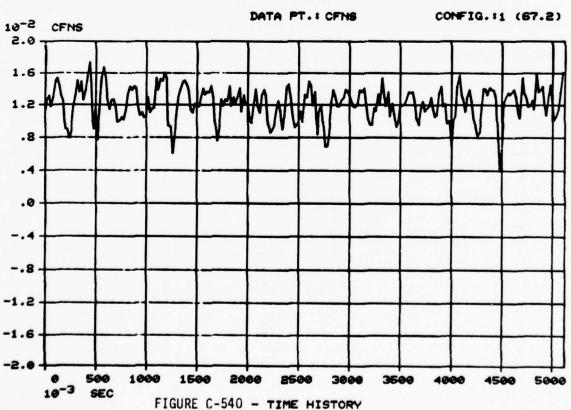


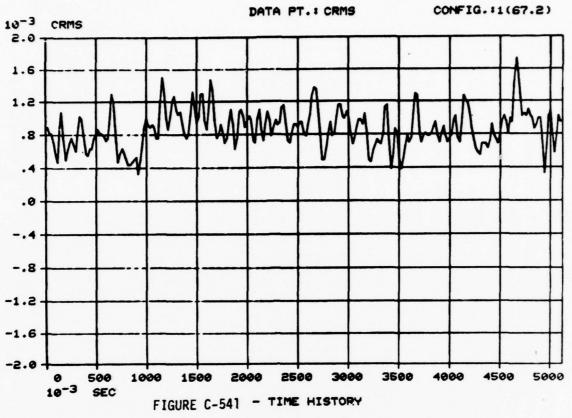


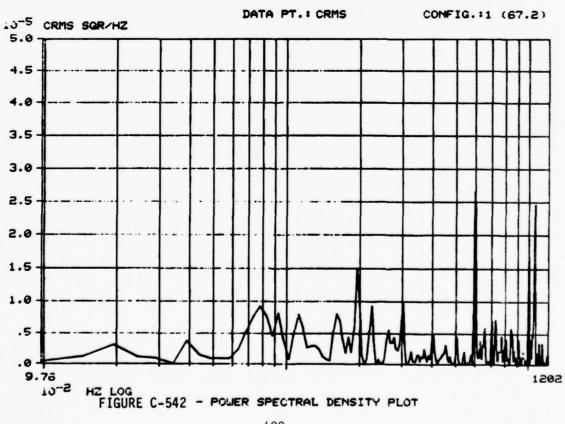


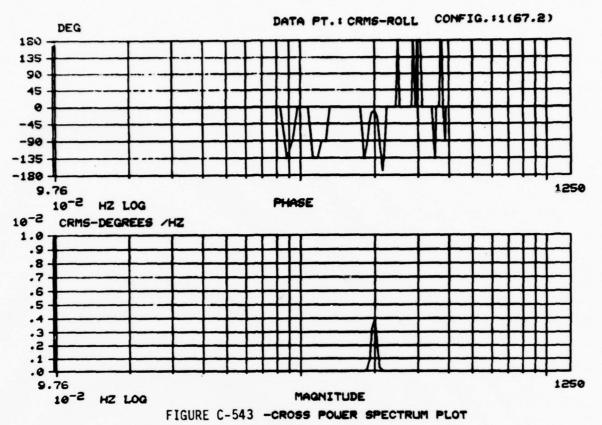




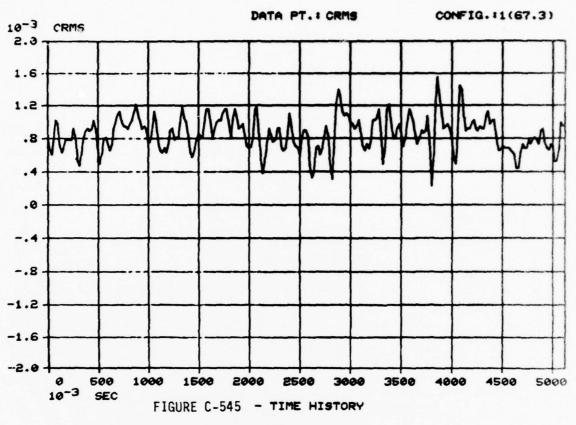


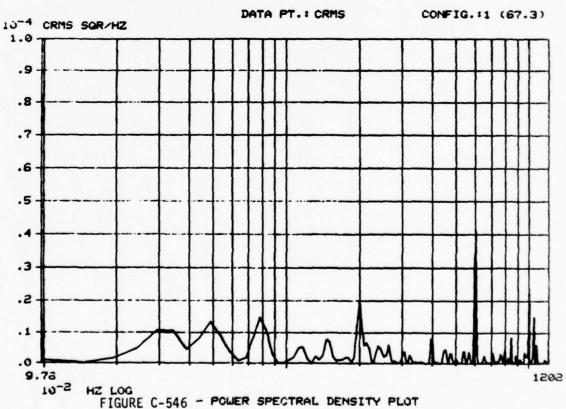


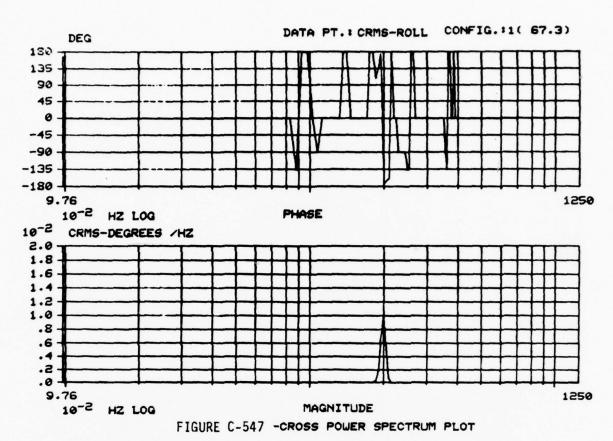




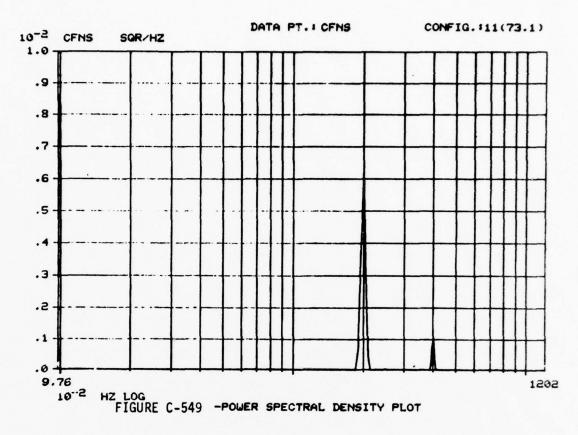
DATA PT. : CFNS CONFIG. 11 (67.3) 10-2 CFNS 5.0 4.0 3.0 2.0 1.0 .0 -1.0 -2.0 -3.0 -5.0 500 1000 1500 2000 2500 3000 3500 4500 10-3 SEC FIGURE C-544 - TIME HISTORY

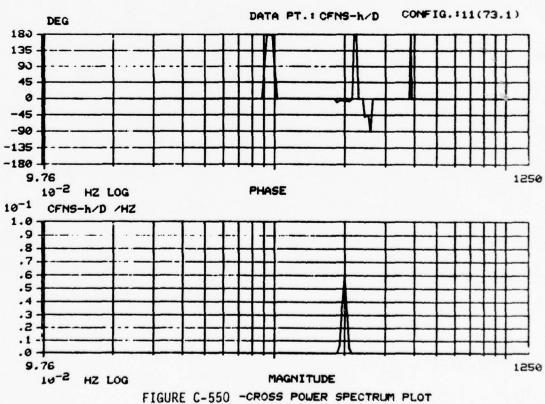


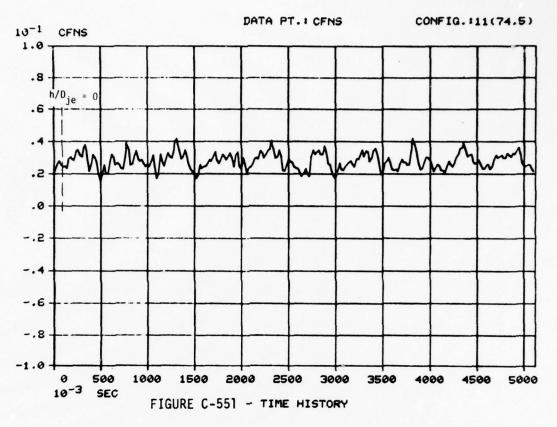


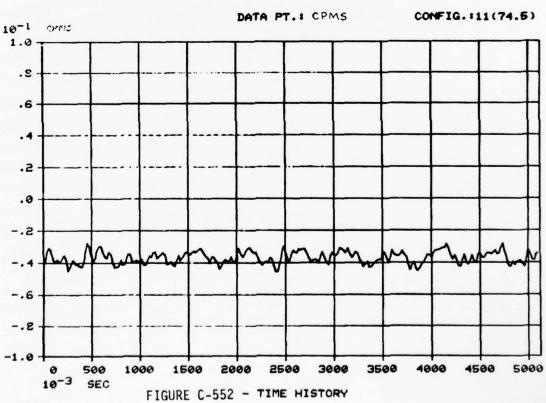


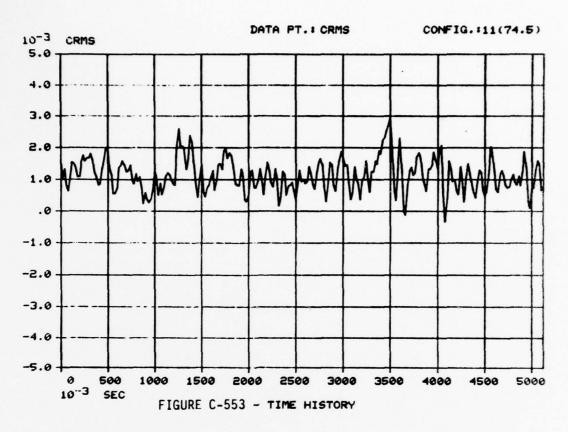
DATA PT. : CFNS CONFIG. :11(73.1) 10-1 CFNS 1.0 .8 .6  $h/D_{je} = 0$ .4 .2 .0 -.2 -.6--.2 -1.0-3500 500 1000 1500 2000 2500 3000 4000 4500 5000 10-3 SEC FIGURE C-548 - TIME HISTORY

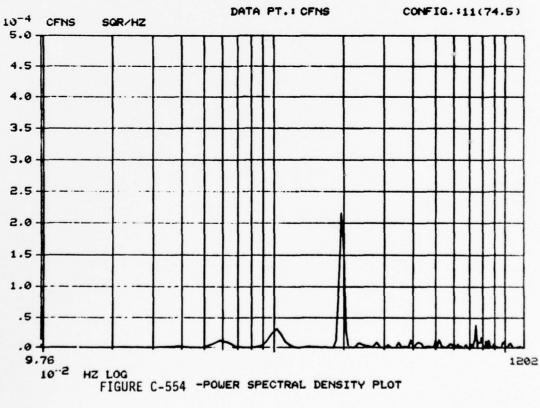


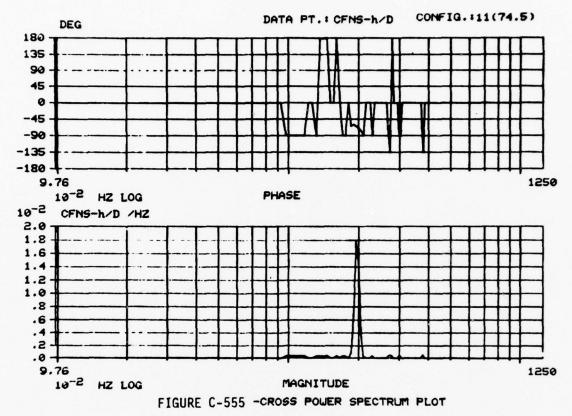












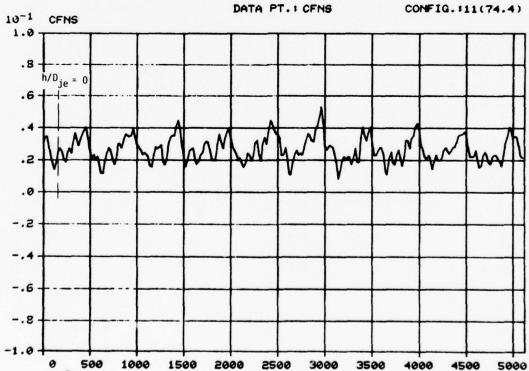
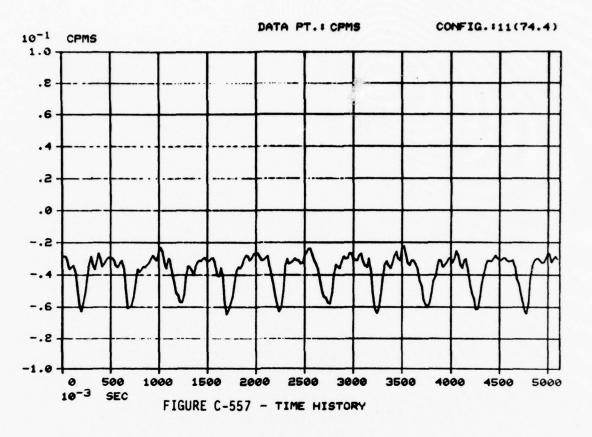
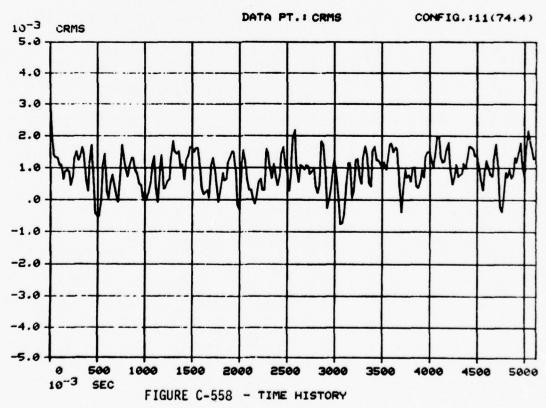
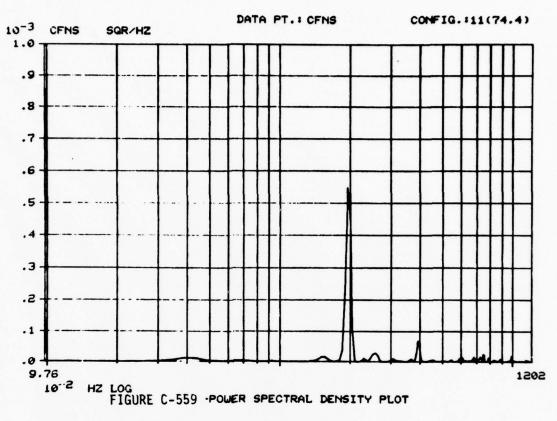


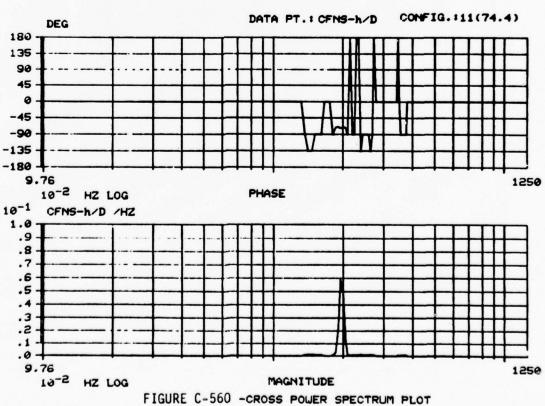
FIGURE C-556 - TIME HISTORY

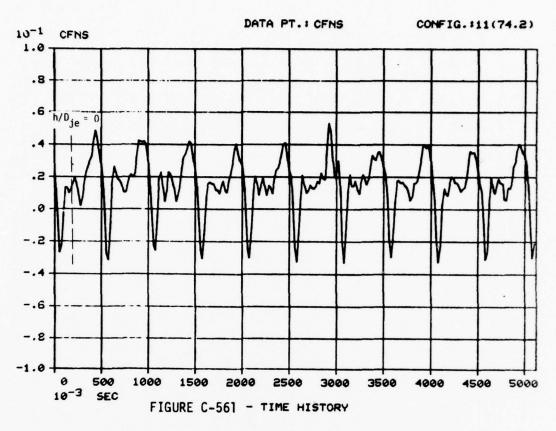
10-3 SEC

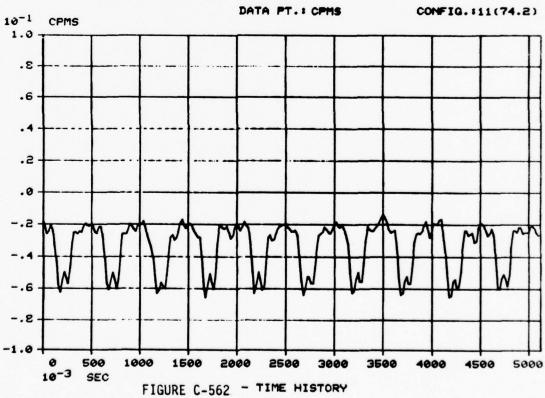


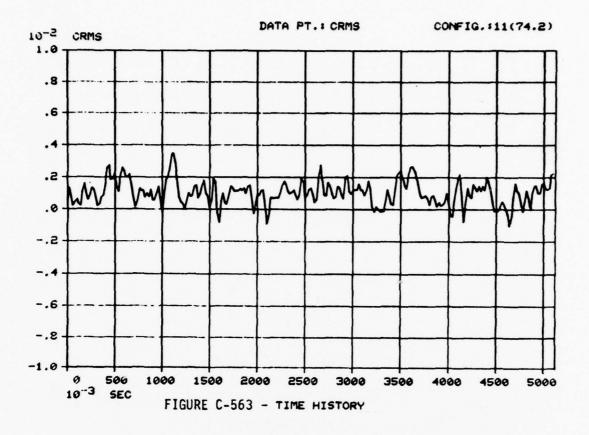


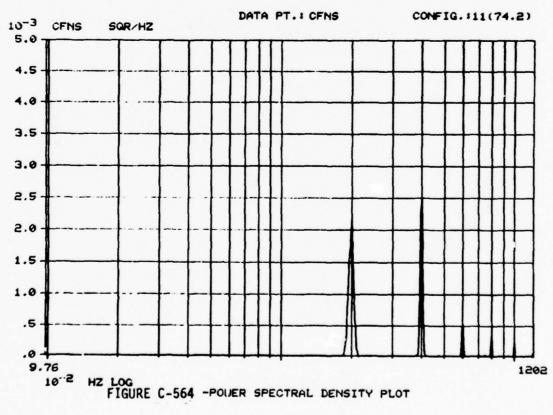


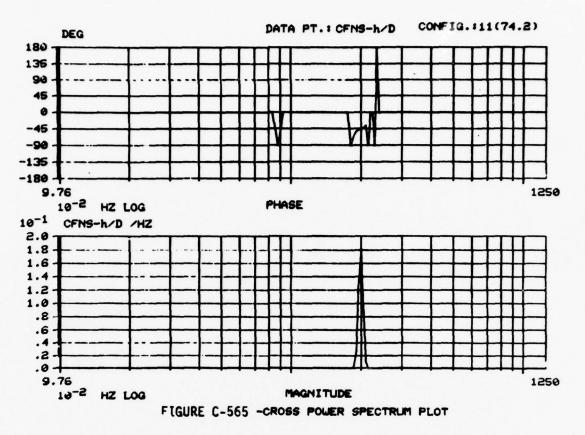


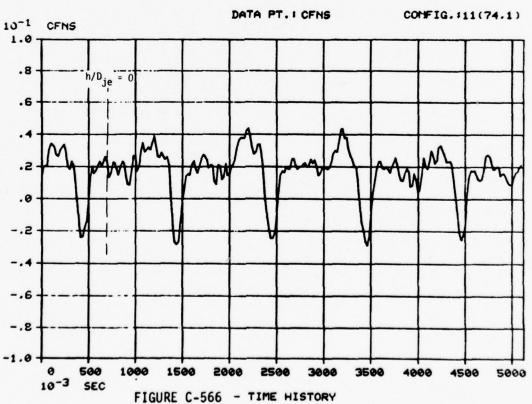


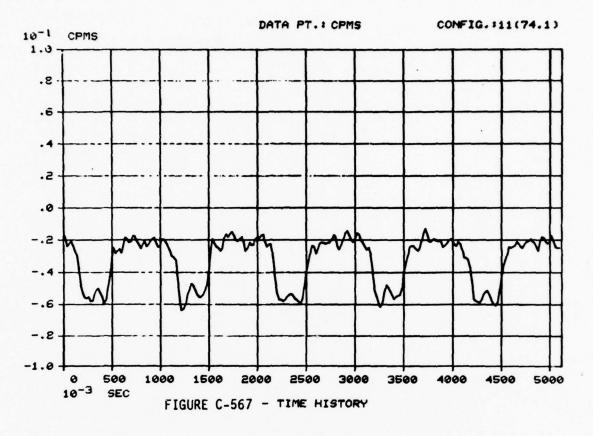


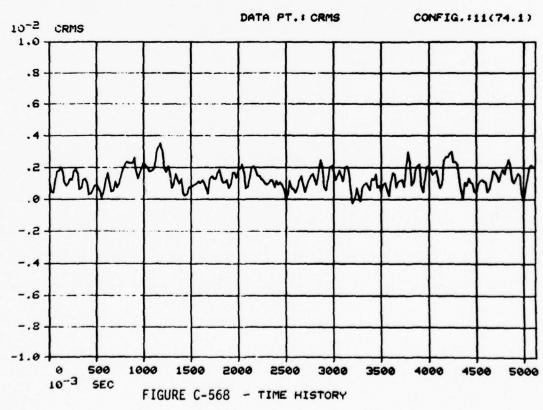


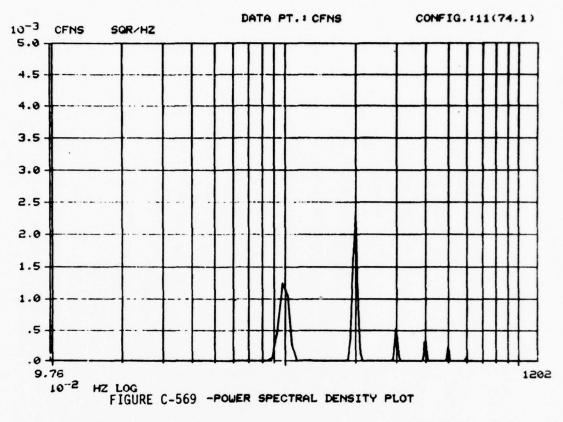


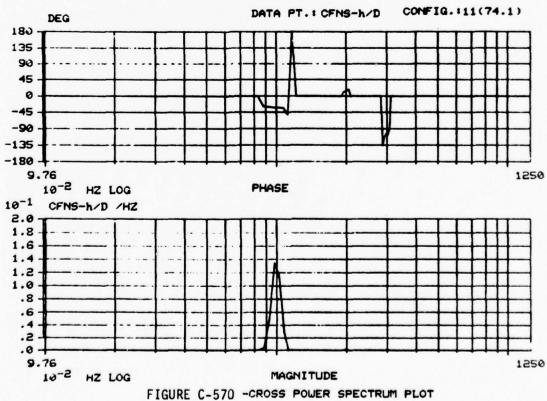


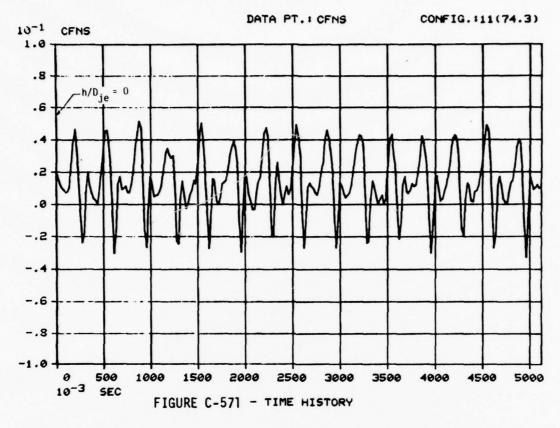


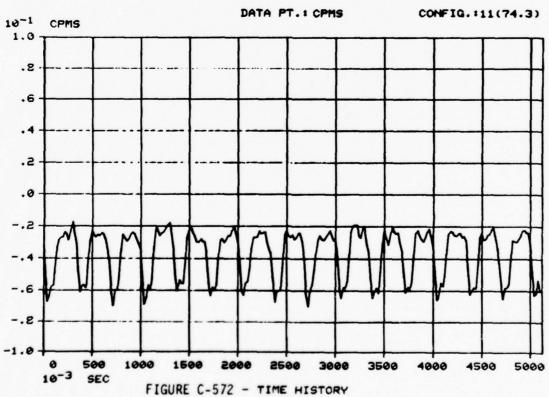


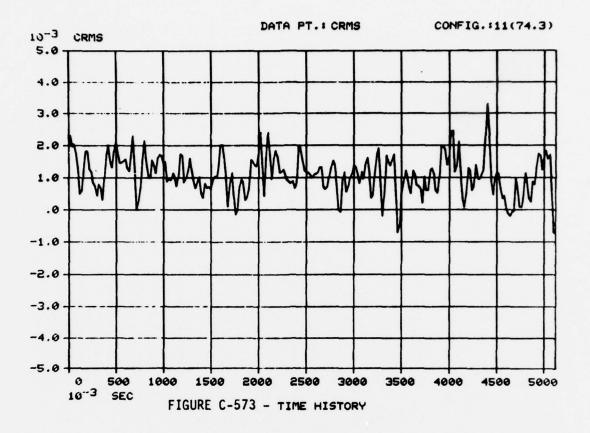


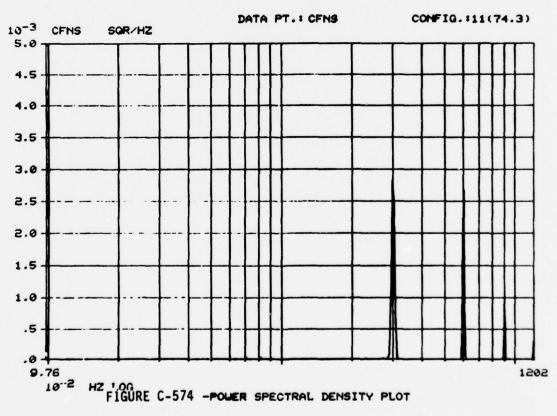


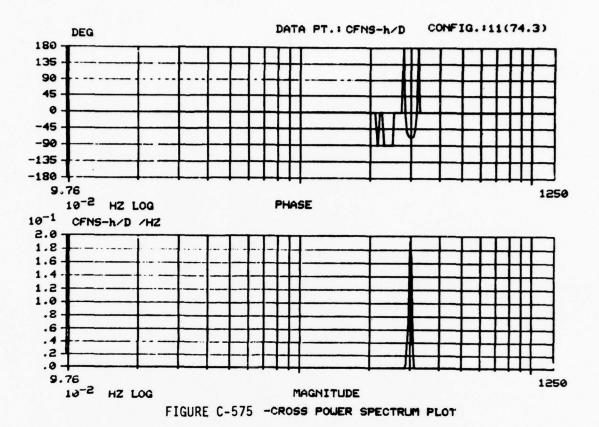


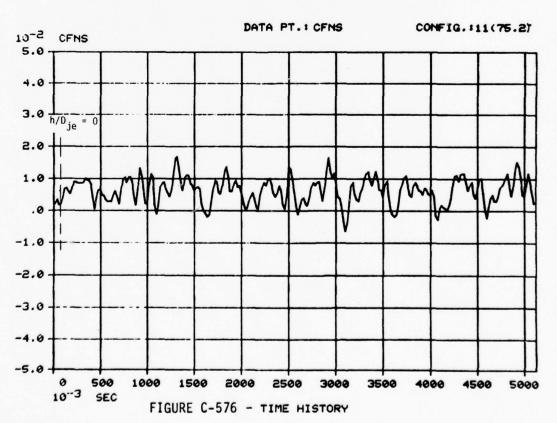


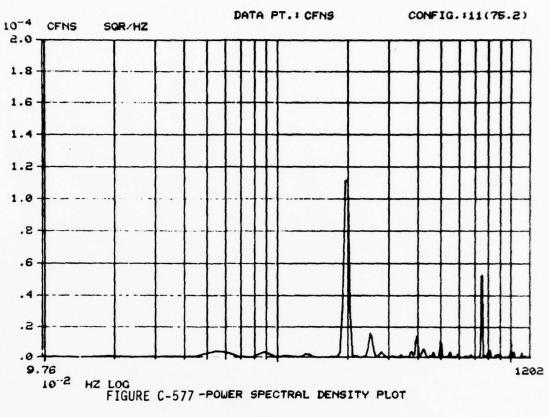


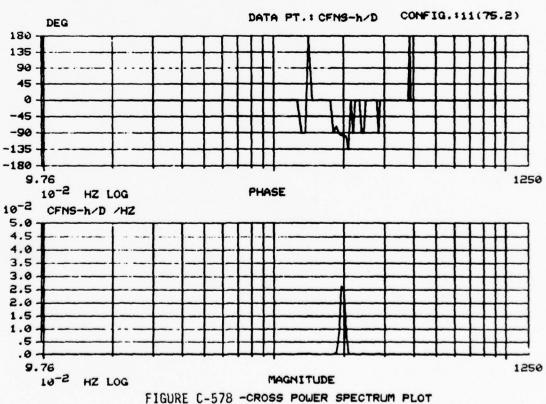


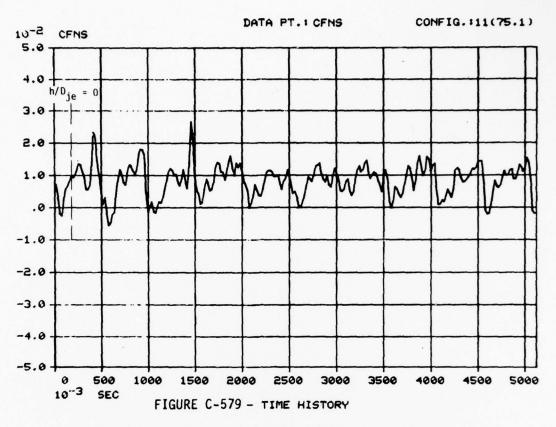


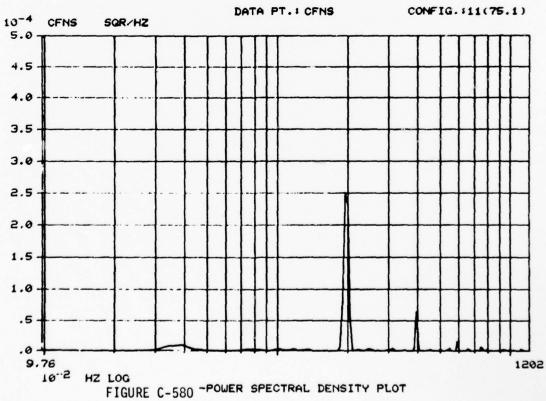


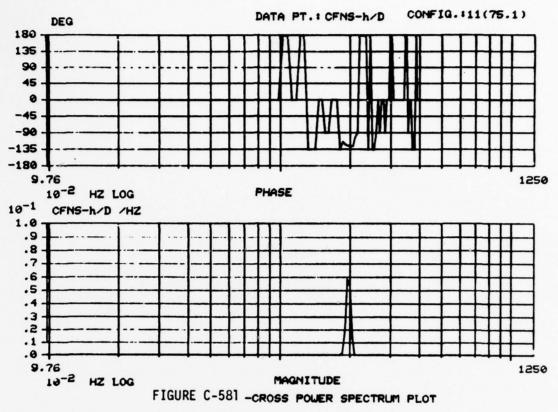


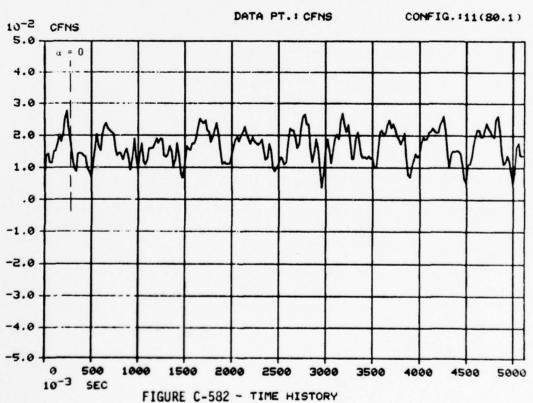


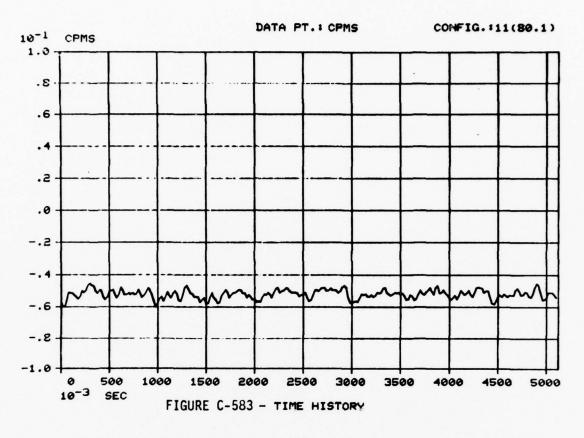


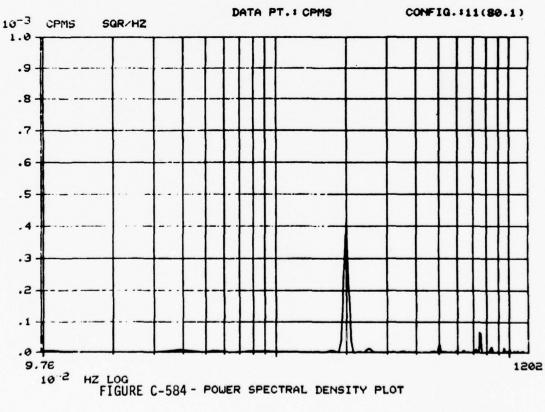


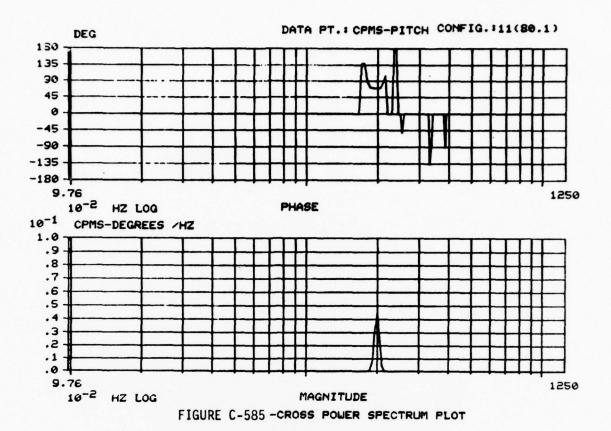


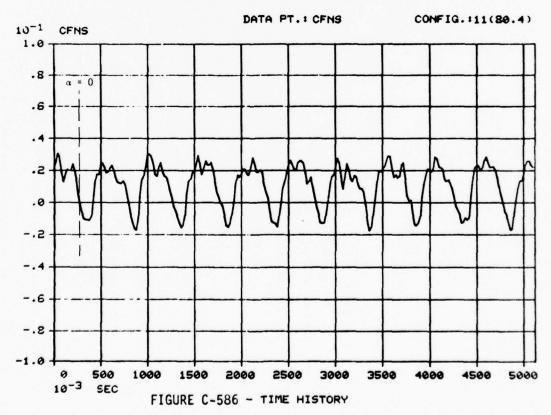


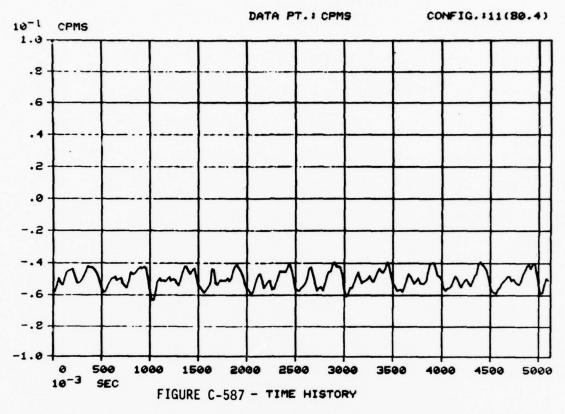


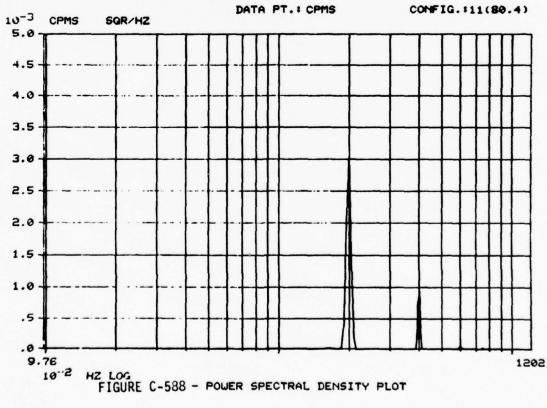


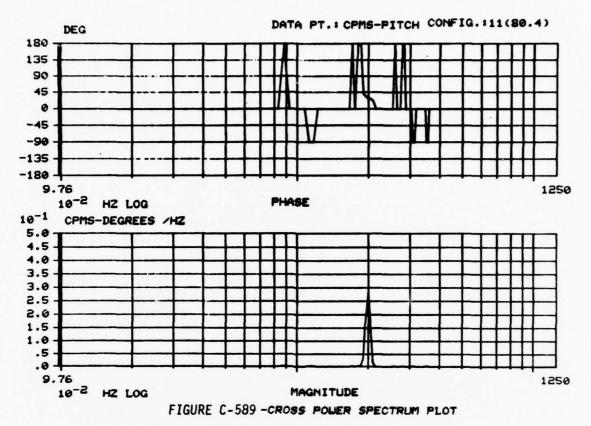


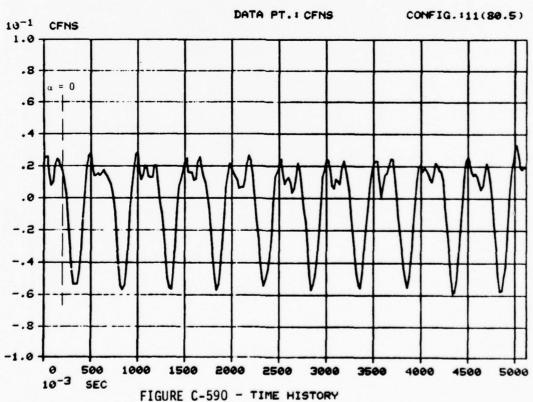


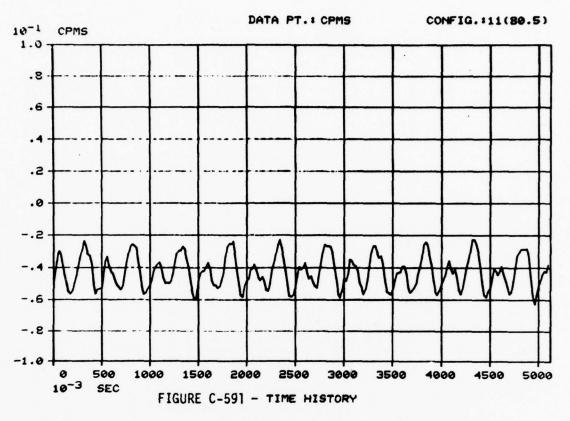


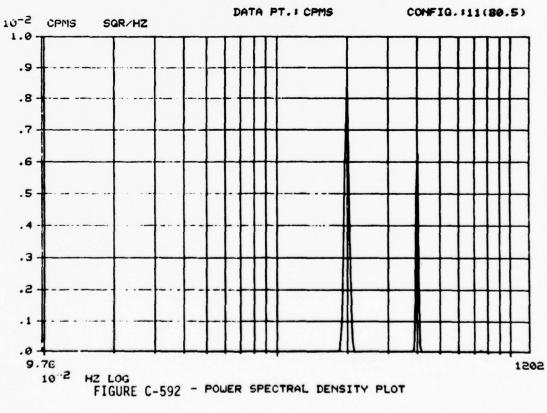


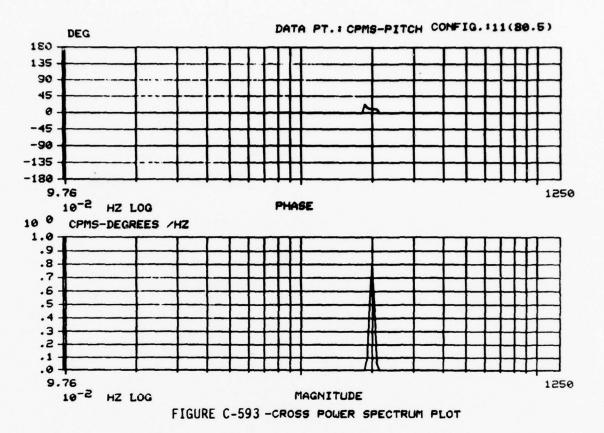


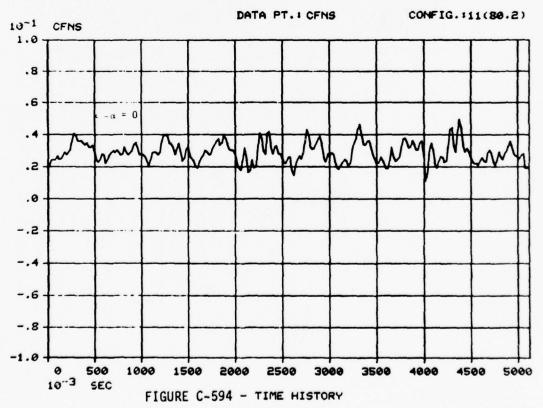


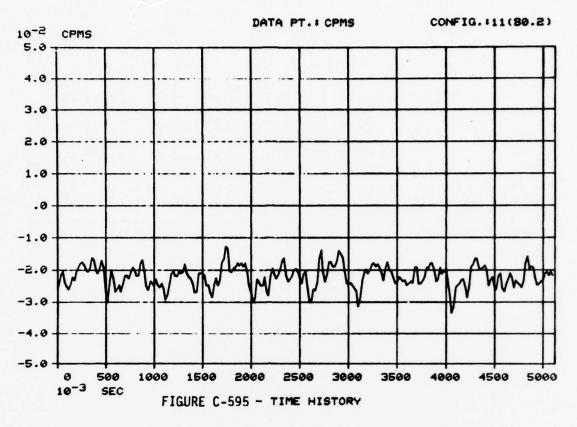


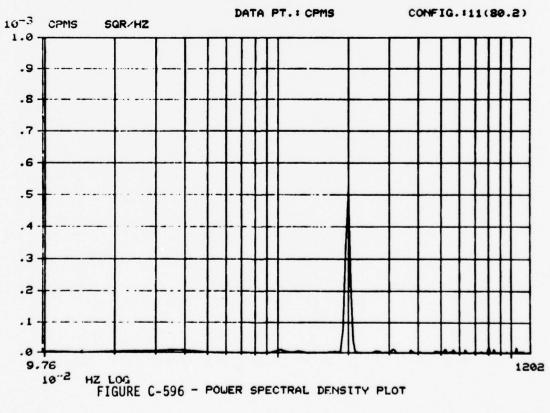


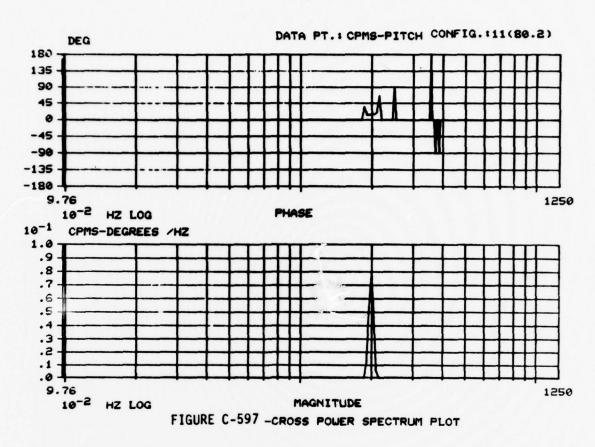


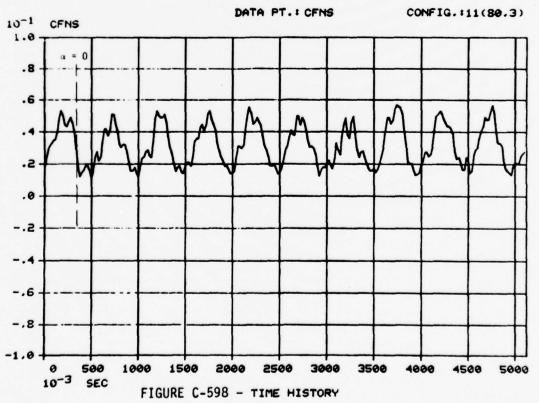


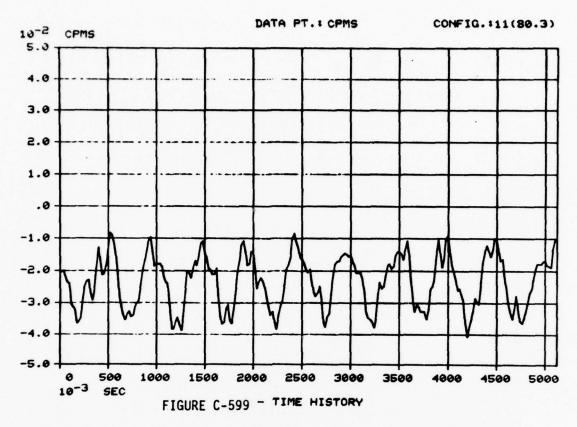


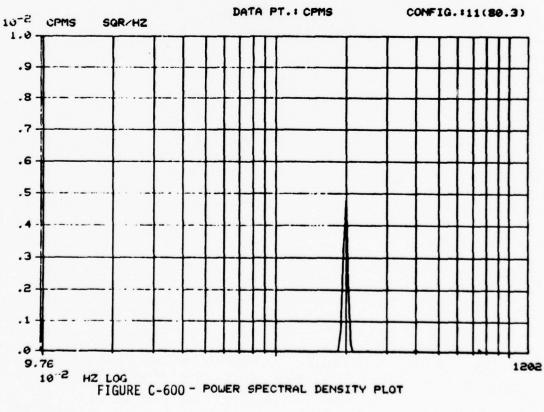


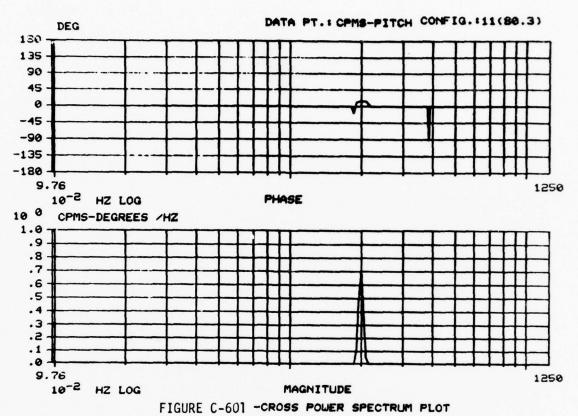


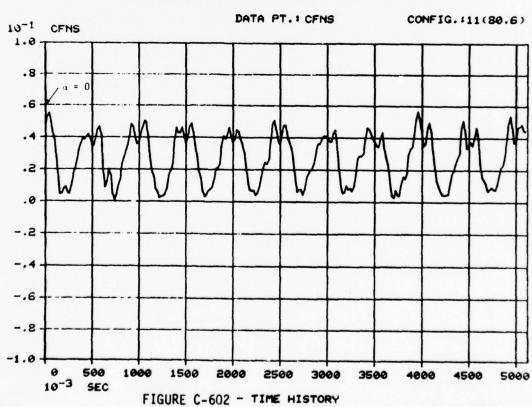


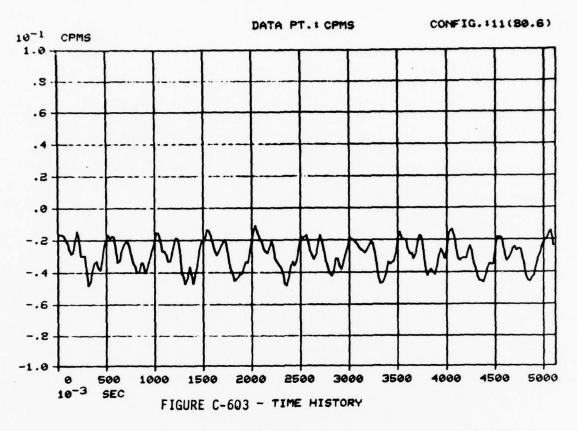


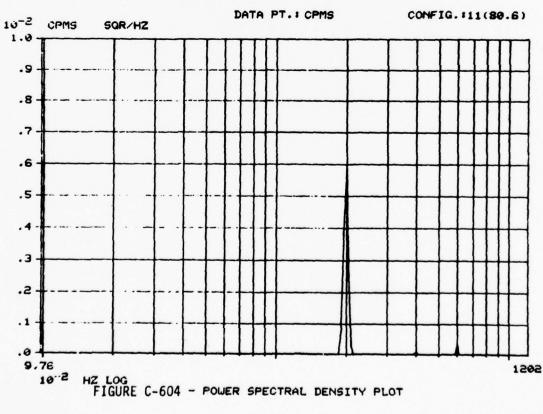


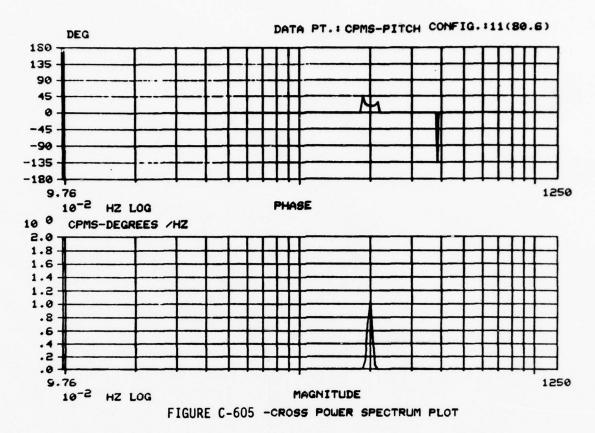


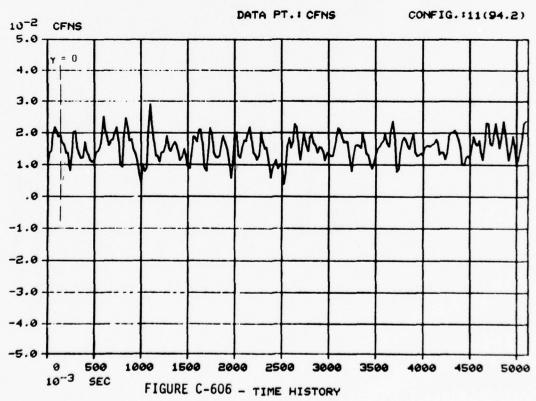


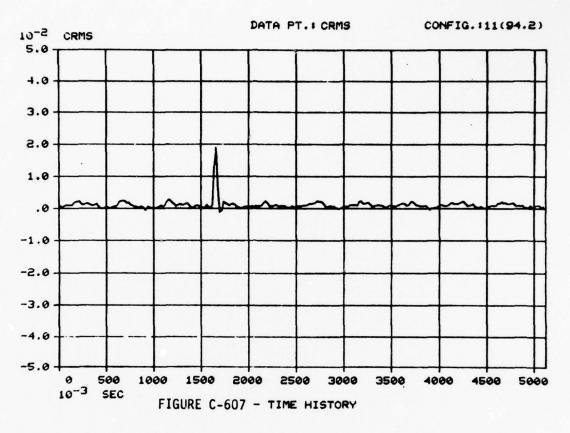


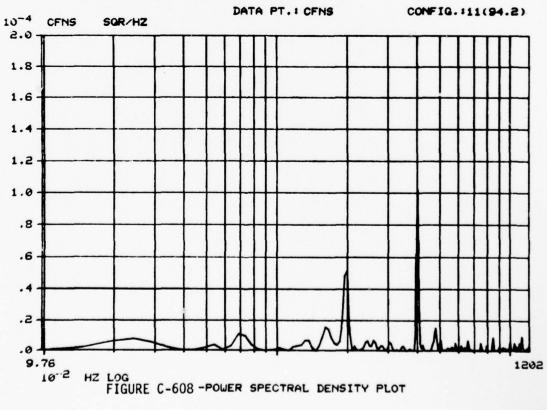


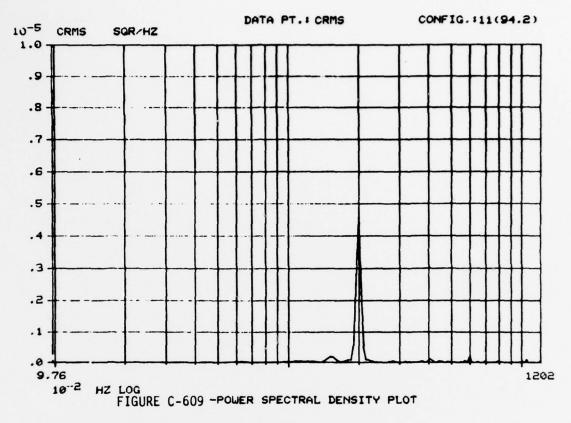


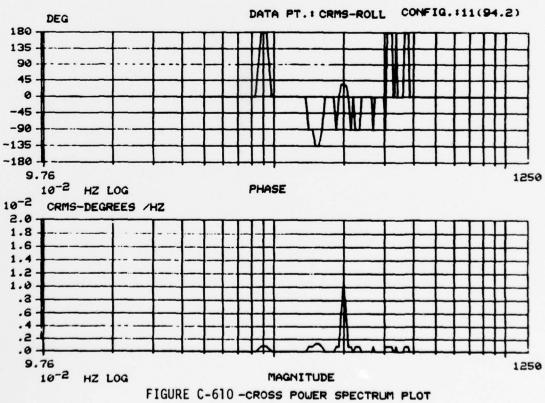


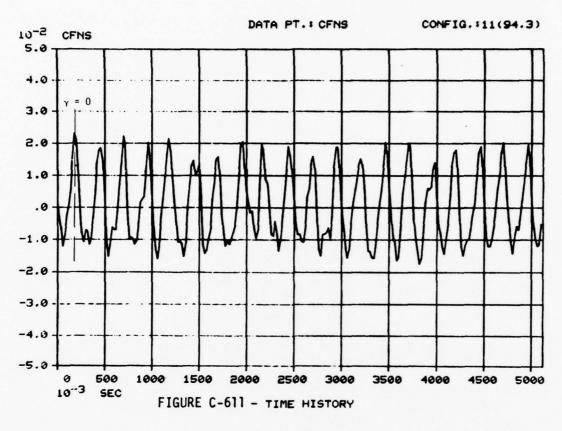


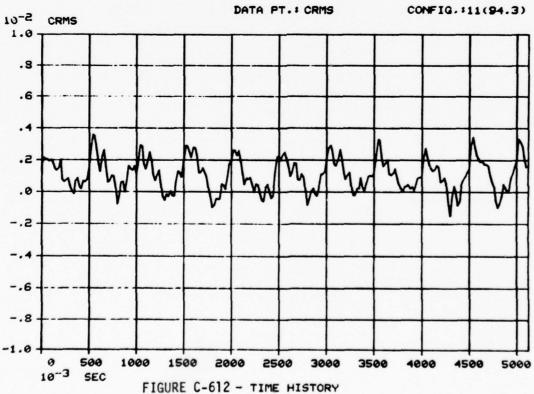


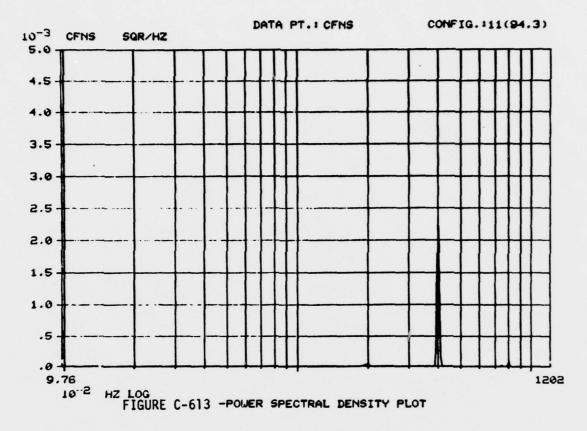


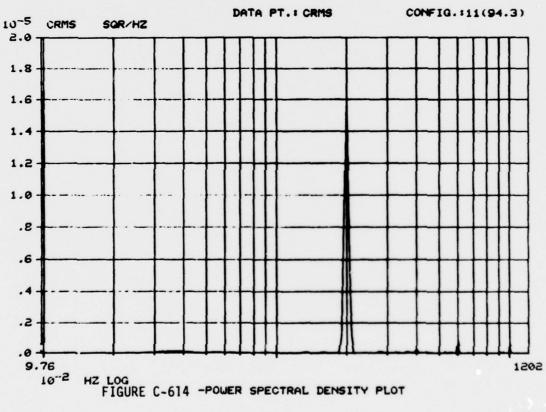


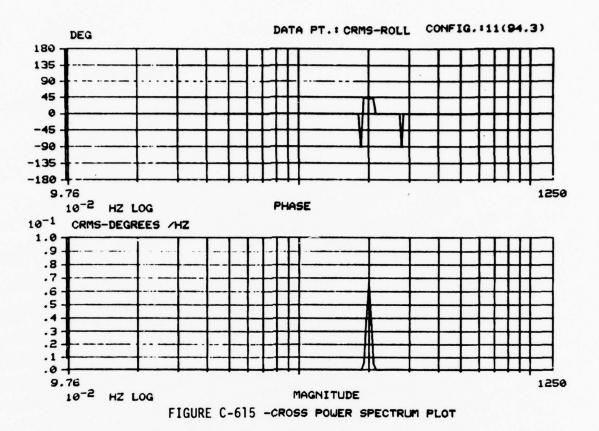


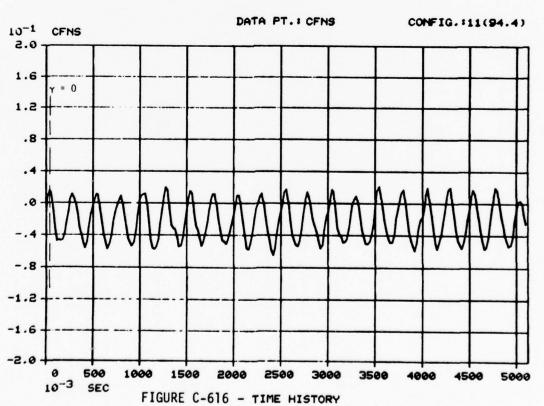


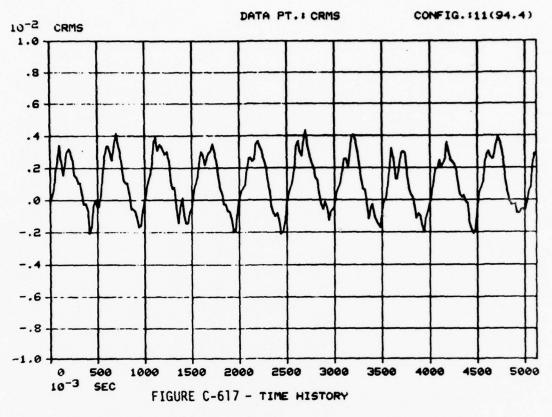


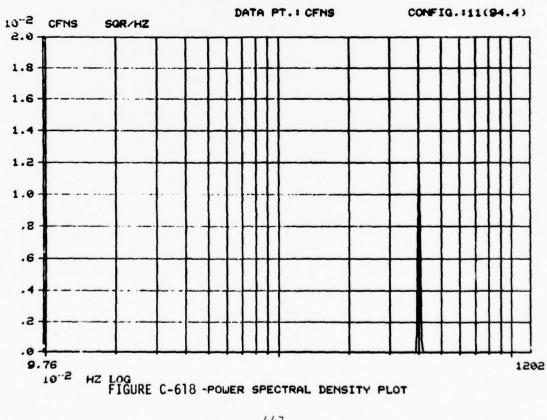


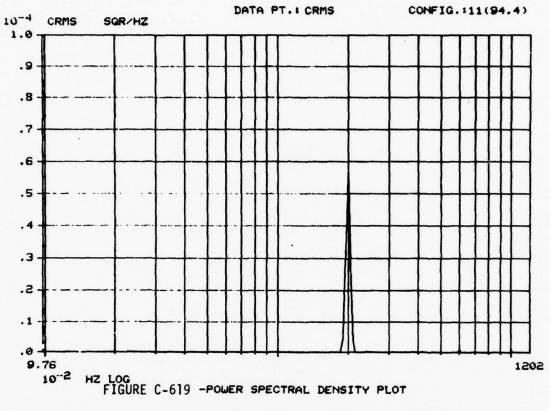












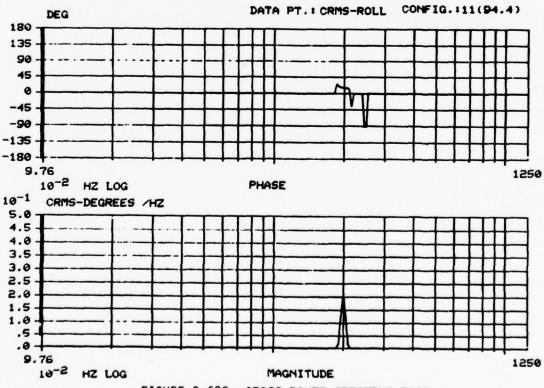
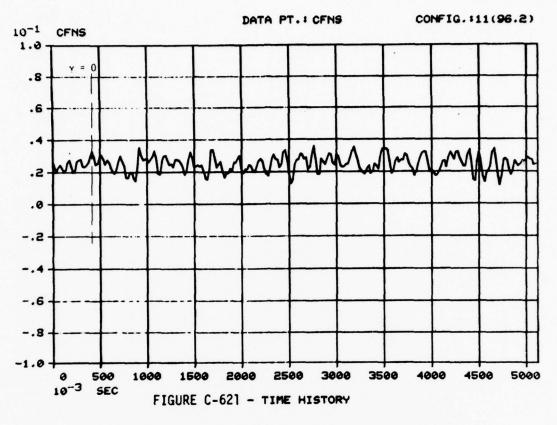
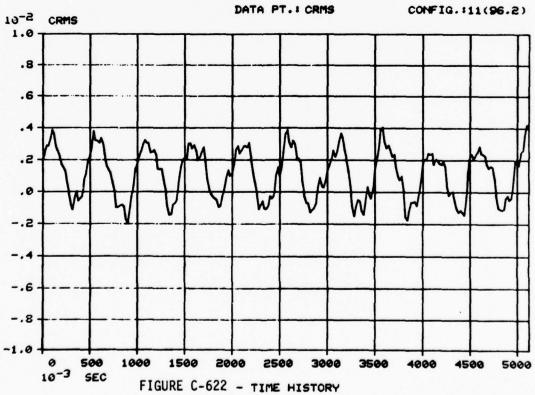
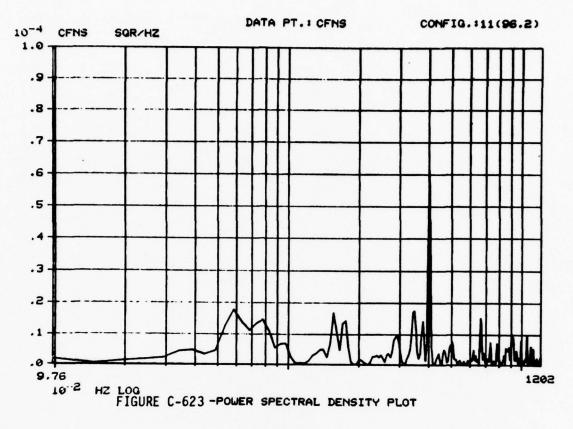
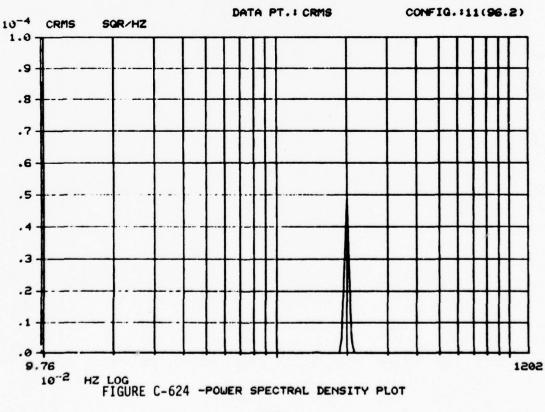


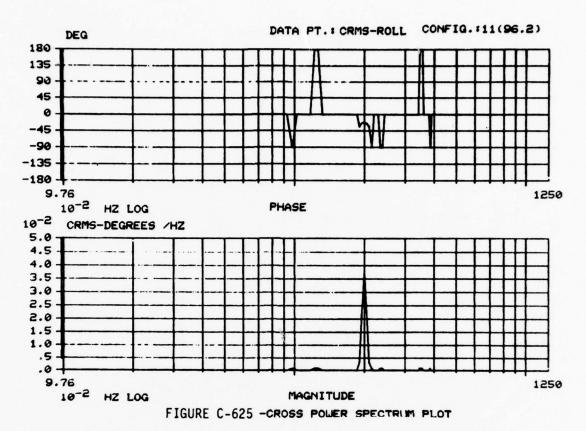
FIGURE C-620 -CROSS POWER SPECTRUM PLOT

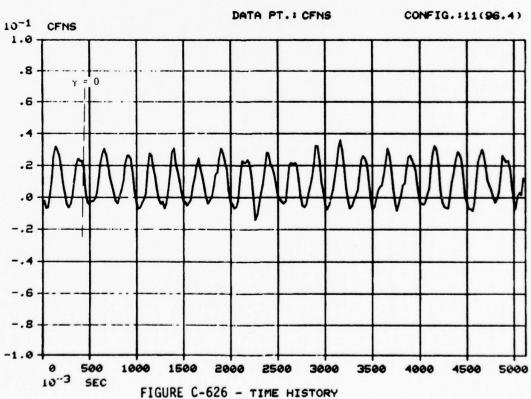


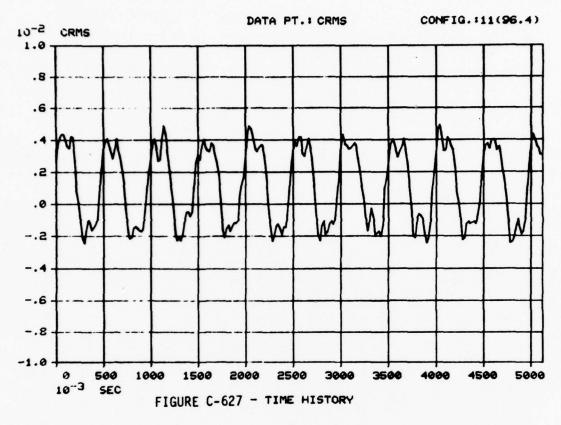


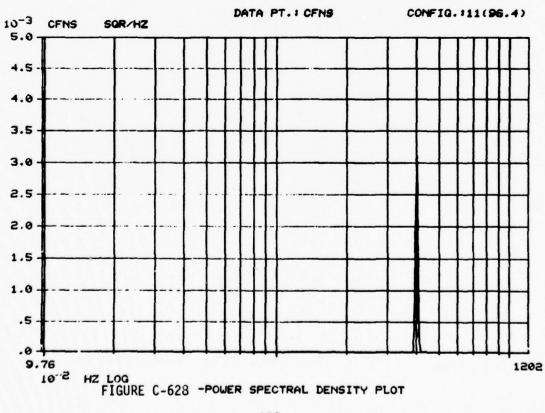


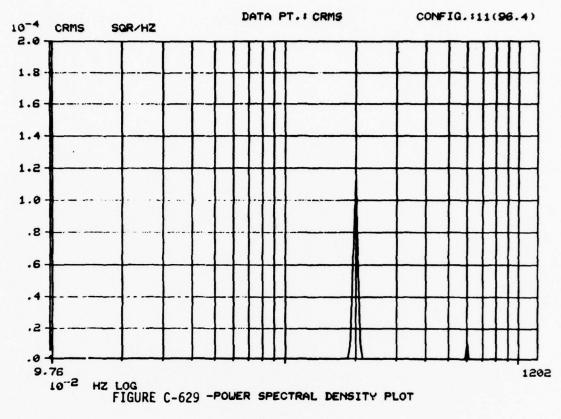


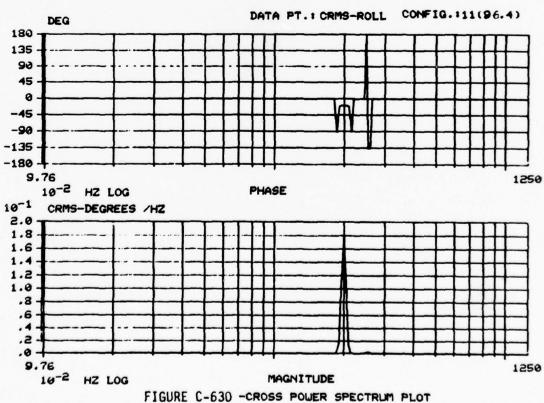


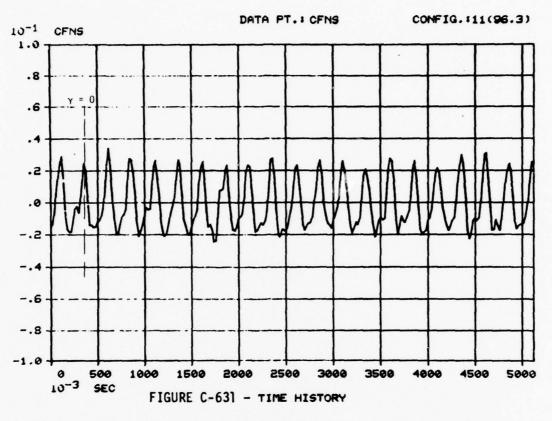


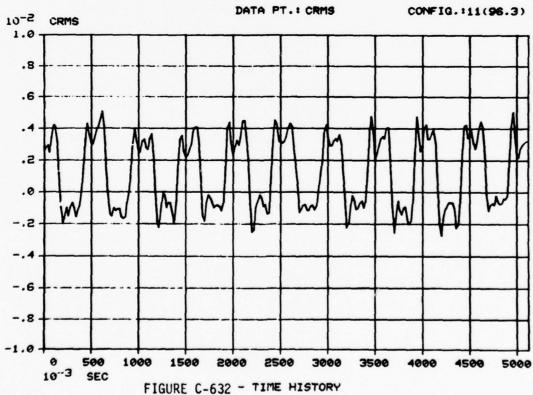


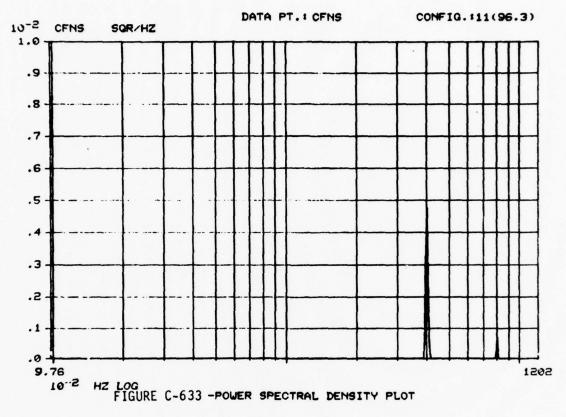


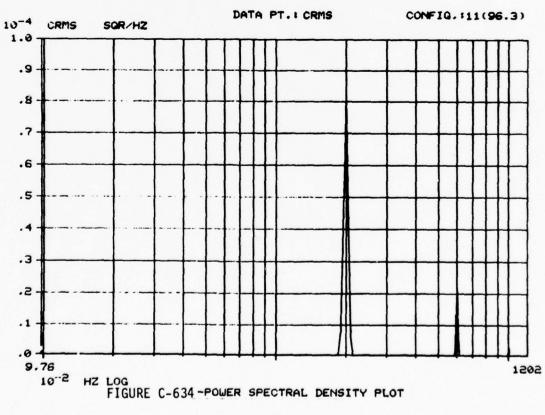












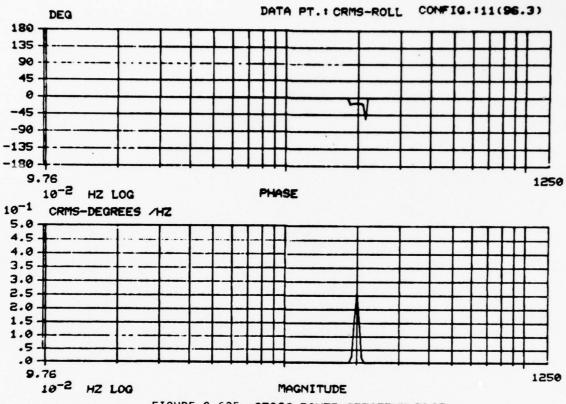
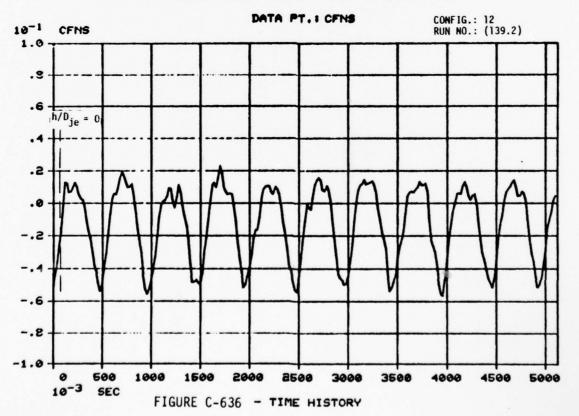
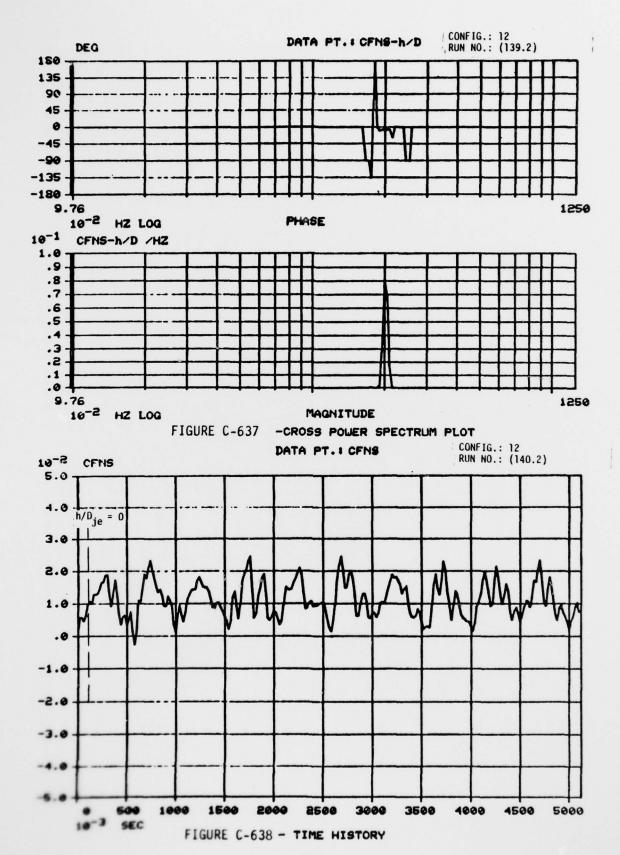
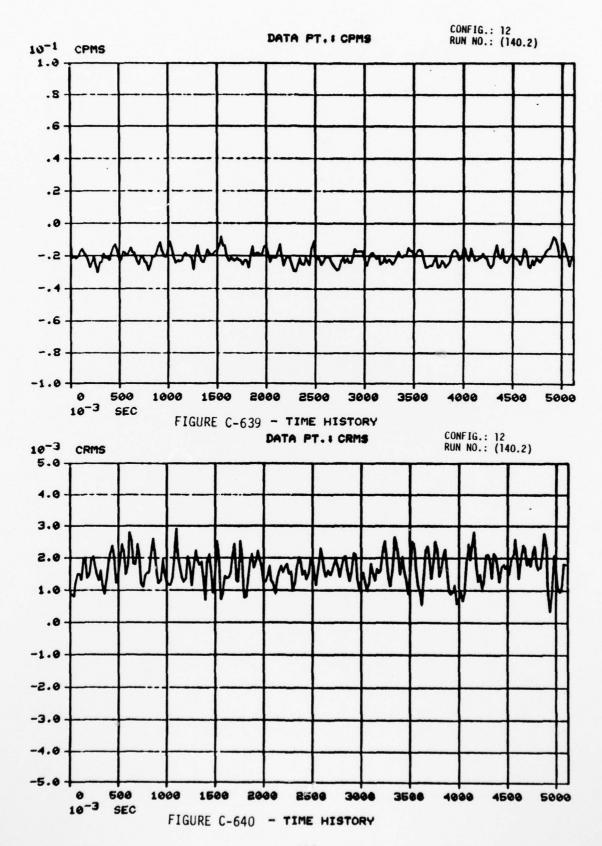
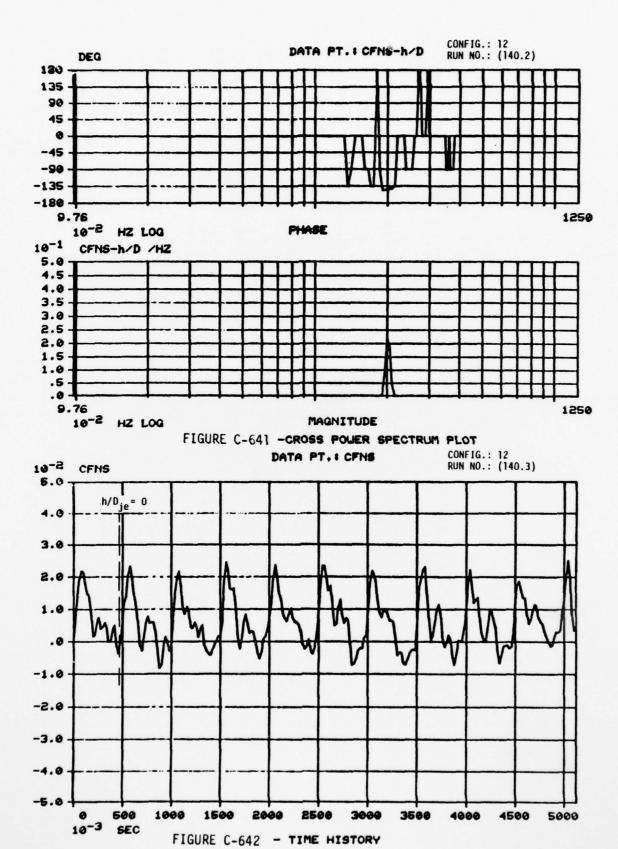


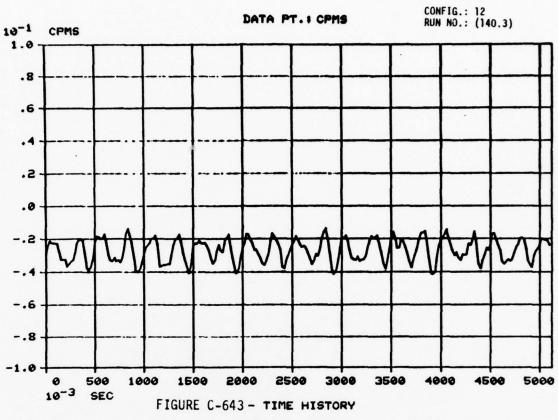
FIGURE C-635 -CROSS POWER SPECTRUM PLOT

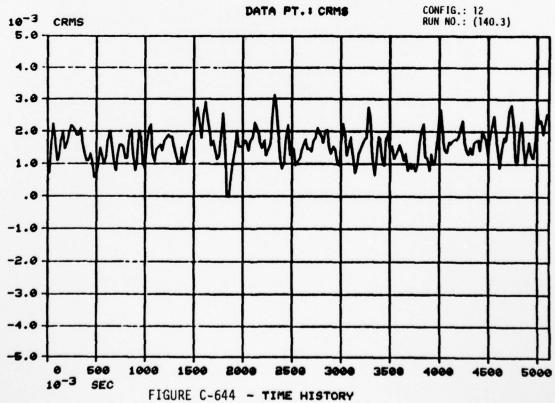


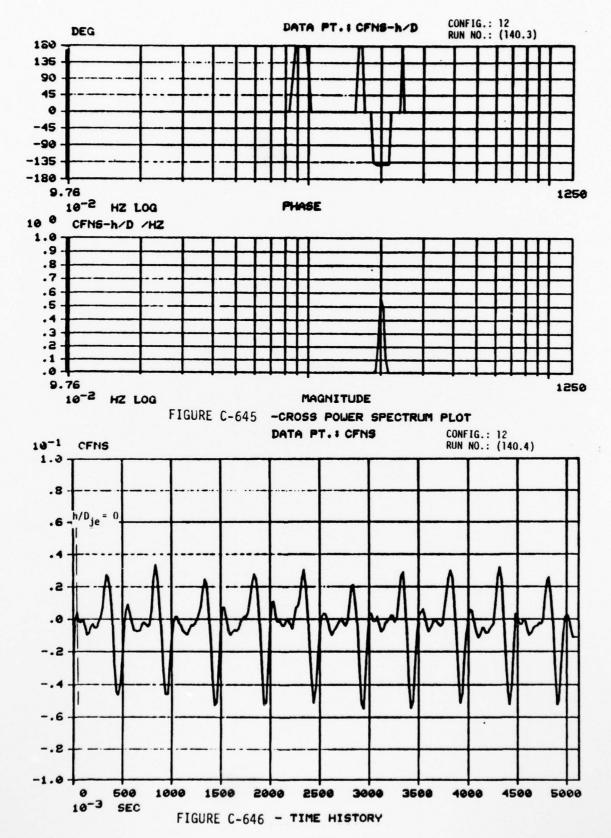


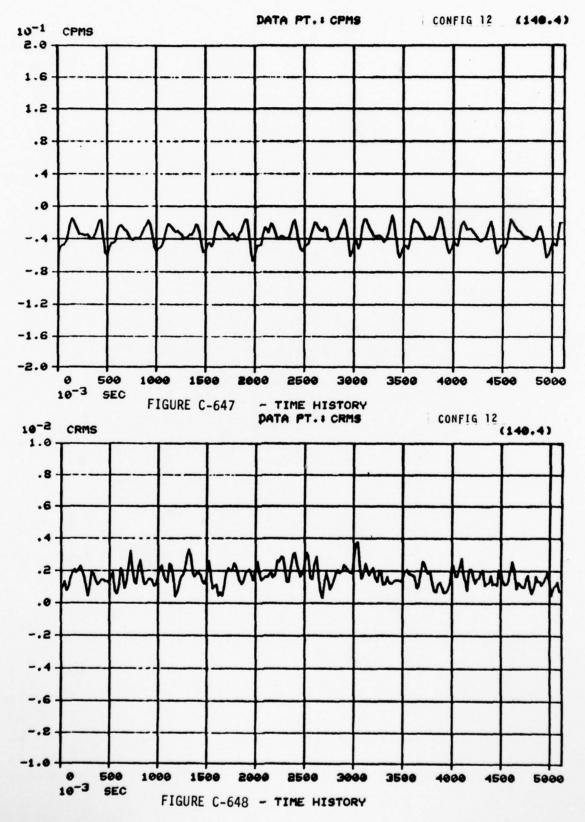


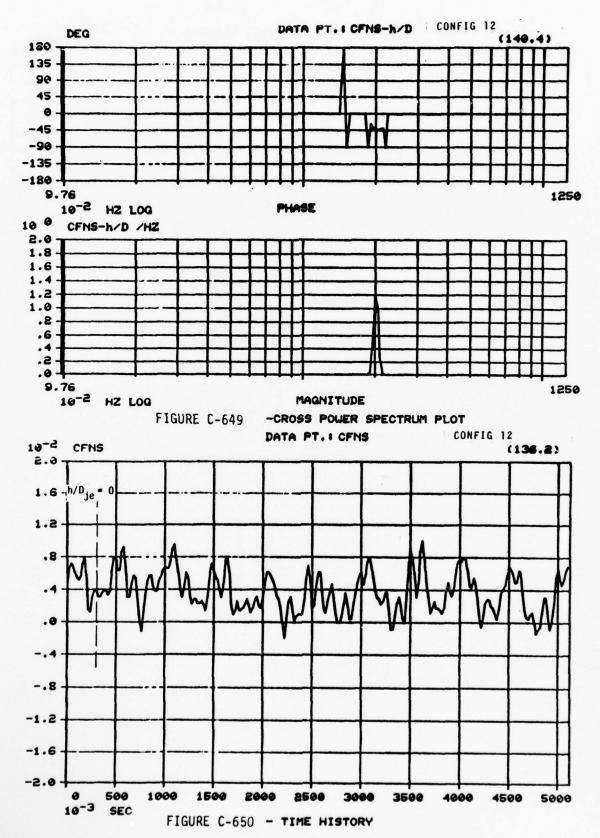


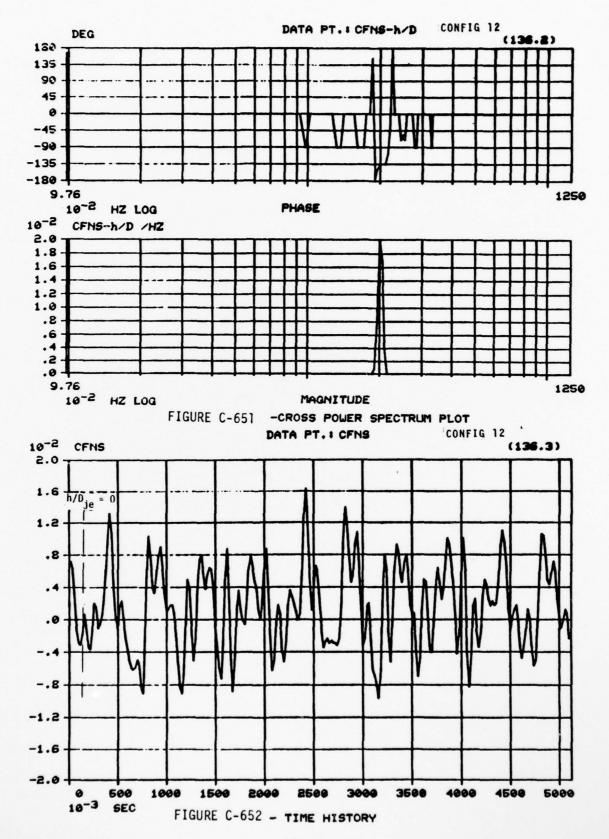


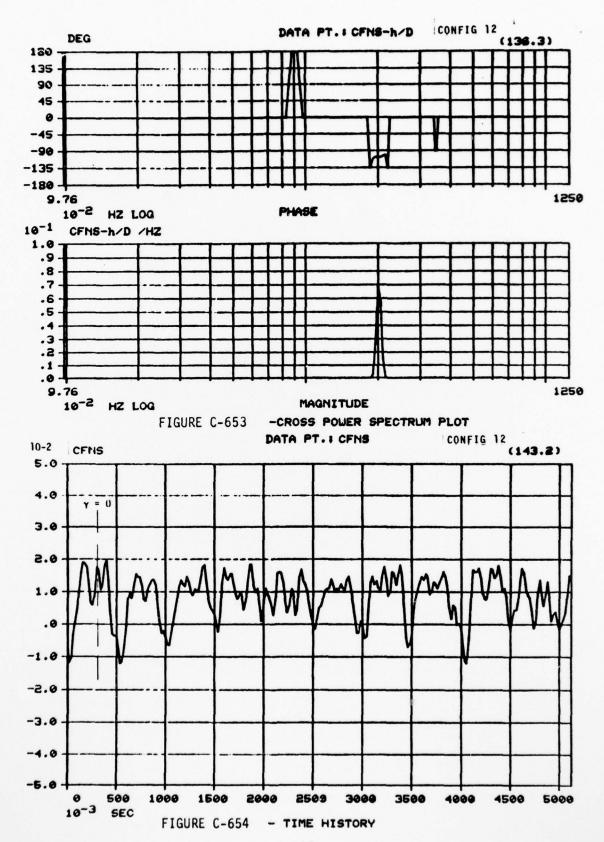












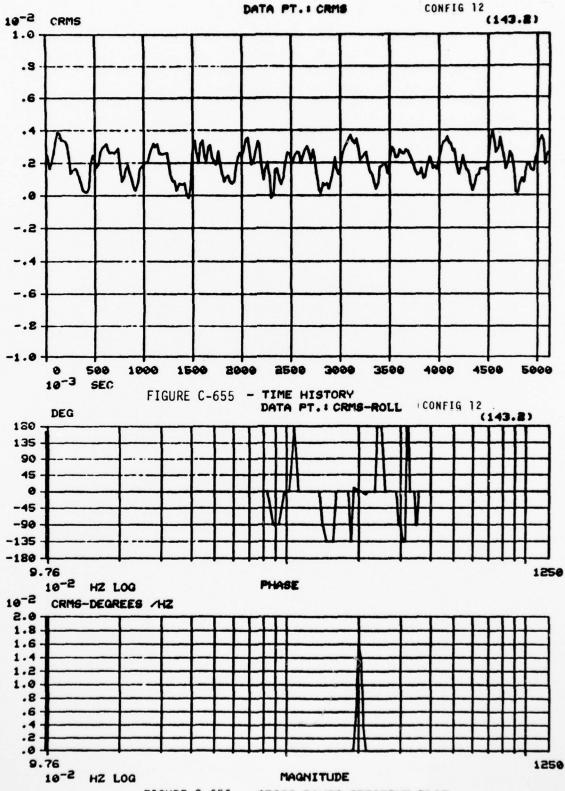
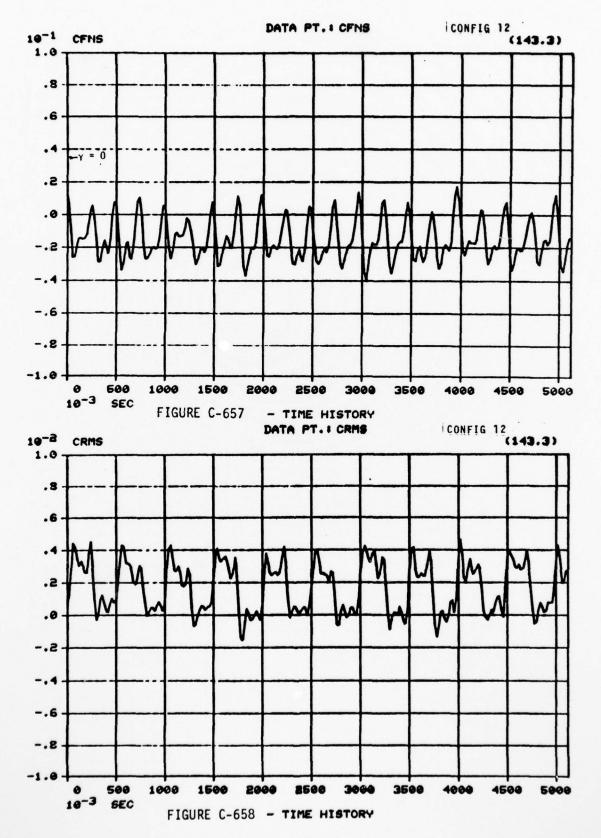
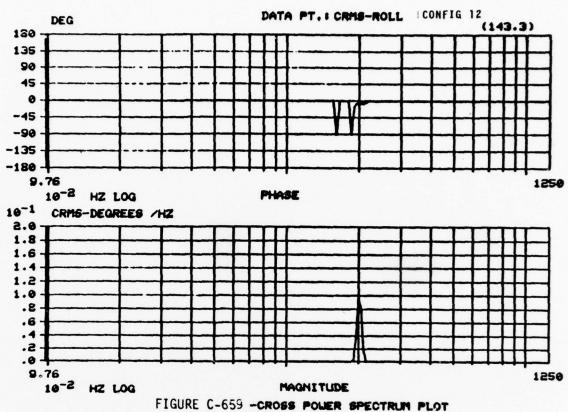
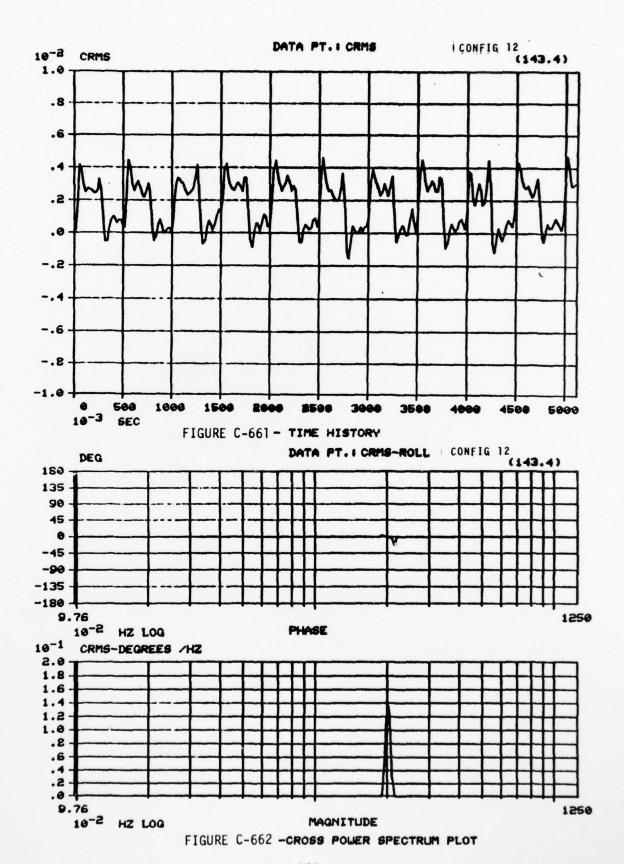


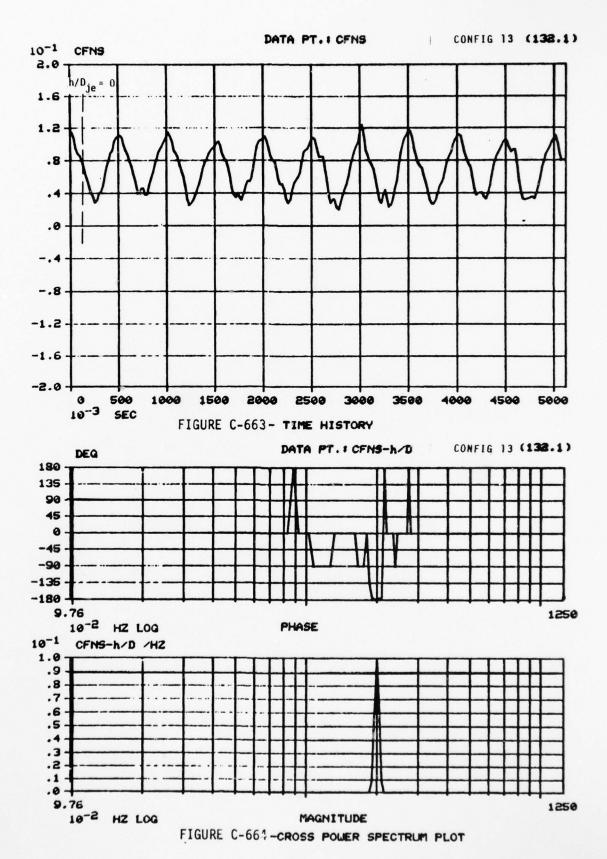
FIGURE C-656 -CROSS POWER SPECTRUM PLOT

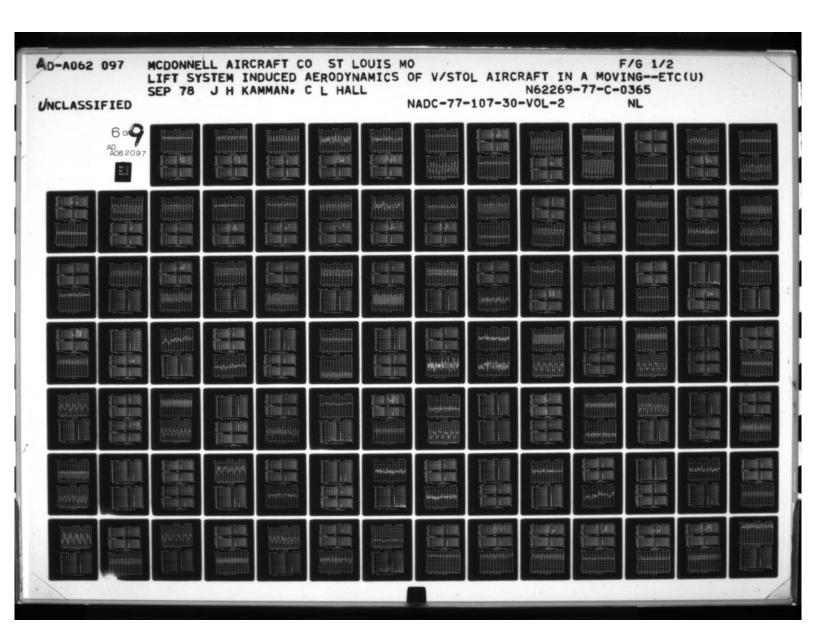




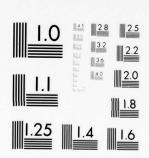
(143.4) DATA PT. : CFNS 10-2 CFNS 5.0 4.0 3.0 0.5 1.0 .0 -1.0 -2.0 -3.0 -4.0 -5.0 3500 2000 2500 500 1000 1500 3000 4000 4500 5000 10-3 SEC FIGURE C-660 - TIME HISTORY



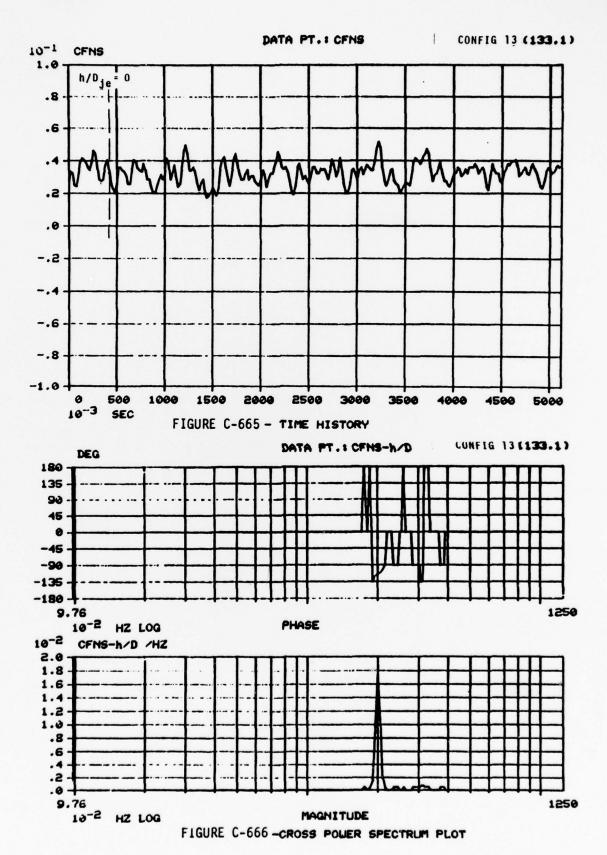


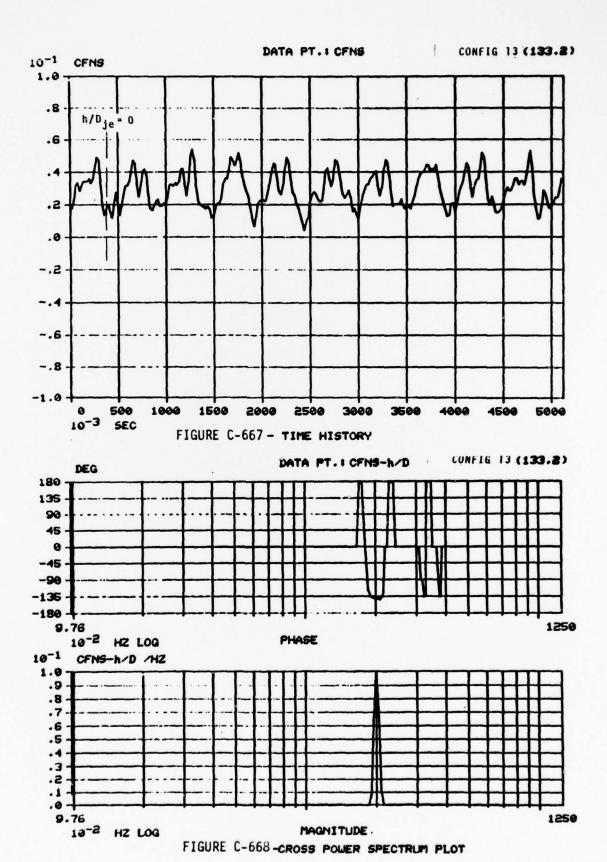


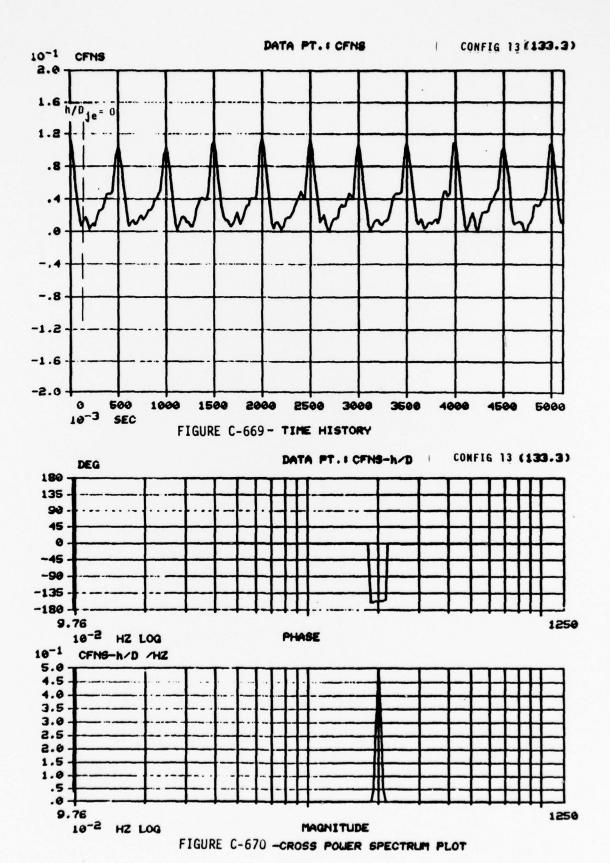
## AD A062097

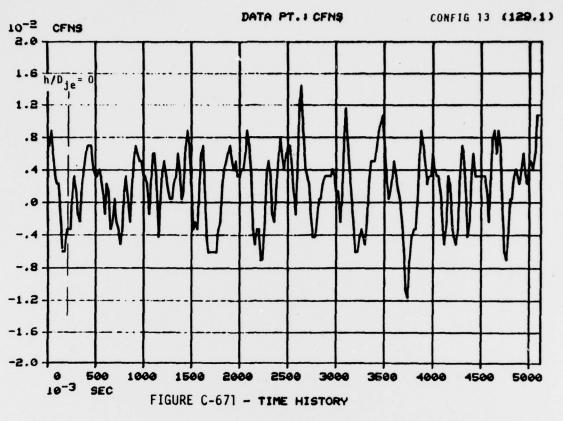


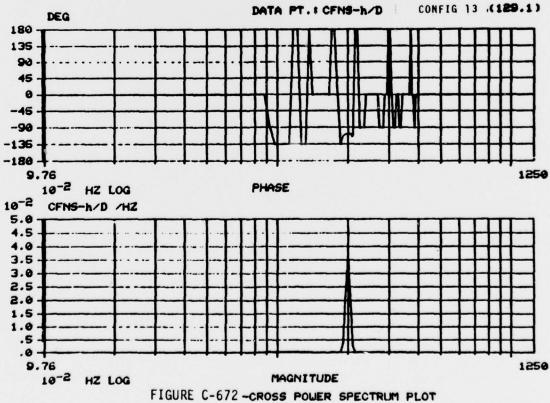
MICROCOPY RESOLUTION TEST CHART NATIONAL BUREAU OF STANDARDS 1963 A

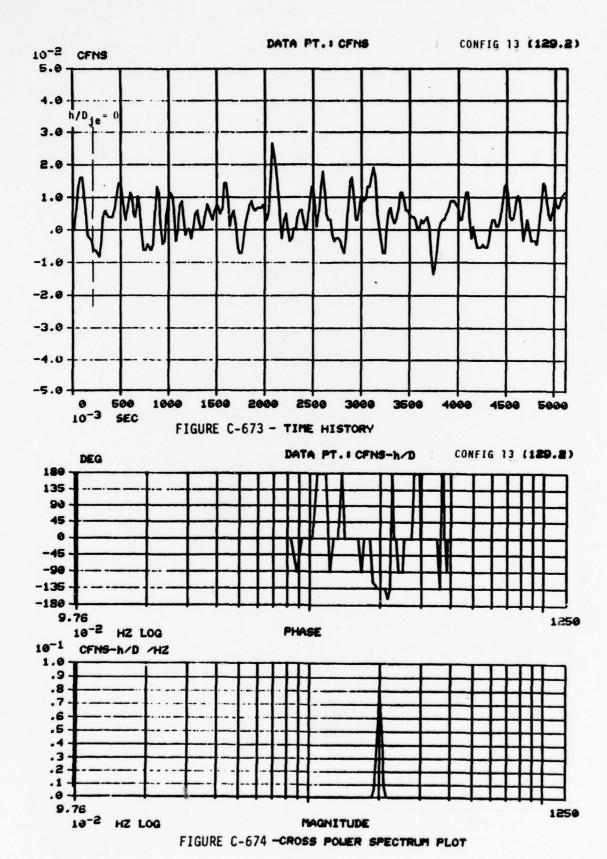


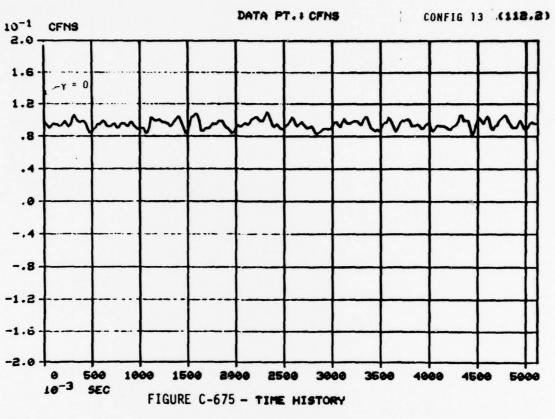


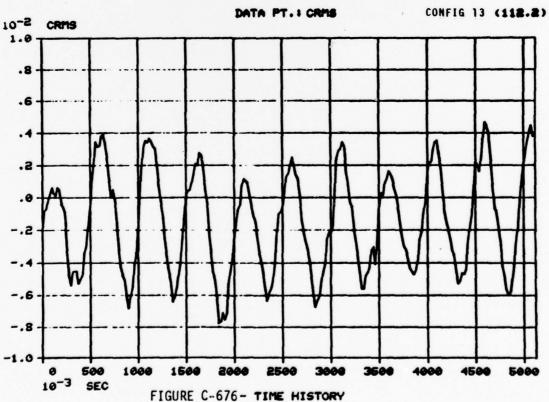












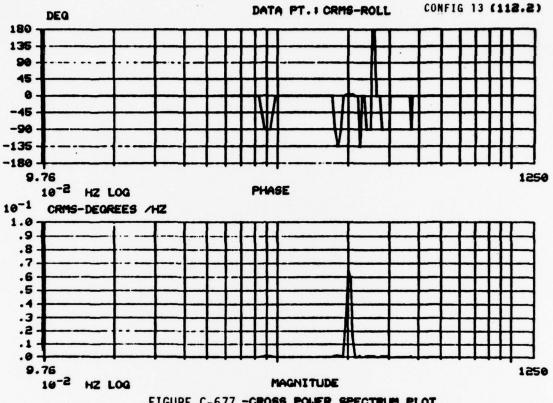
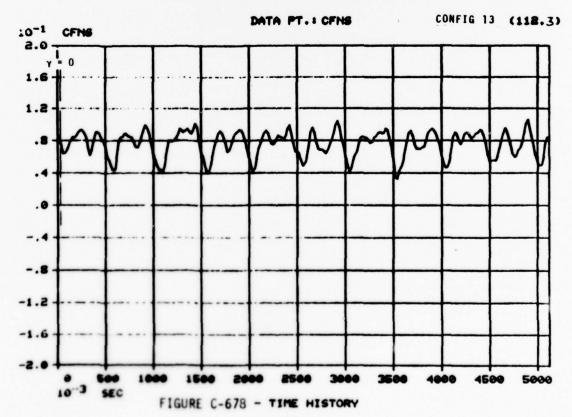
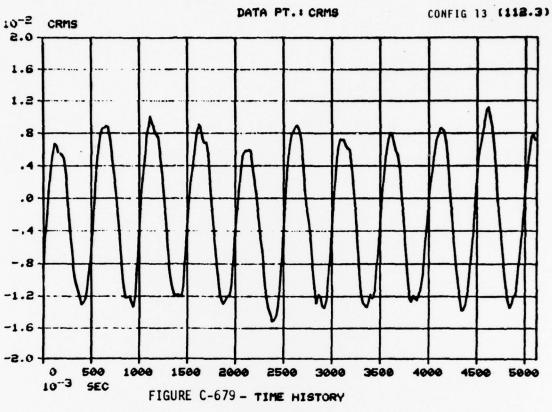


FIGURE C-677 -CROSS POWER SPECTRUM PLOT





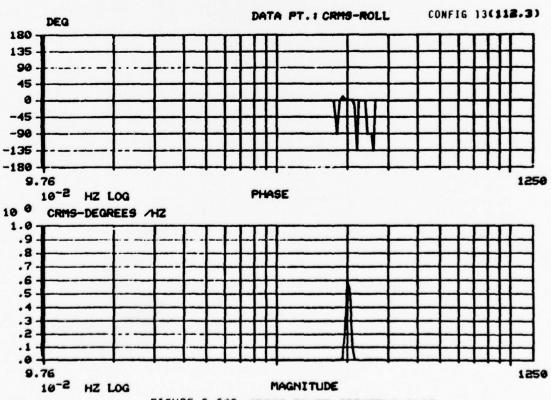
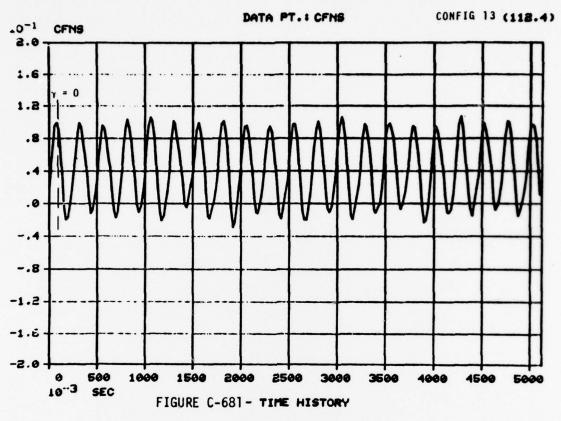
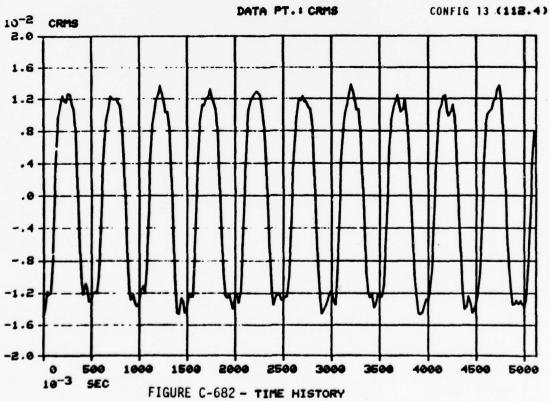
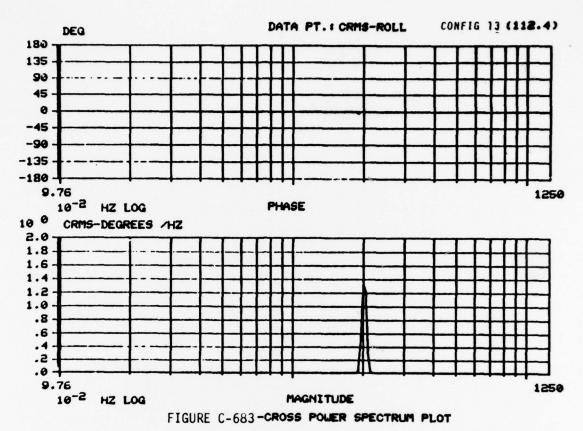


FIGURE C-680 -CROSS POWER SPECTRUM PLOT

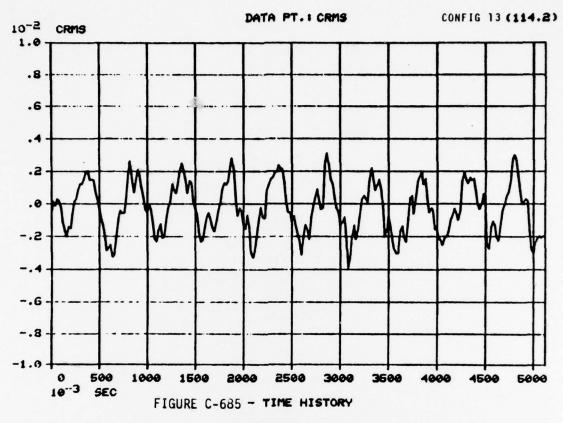


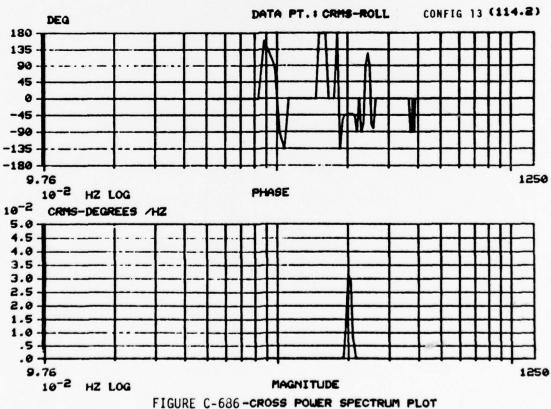


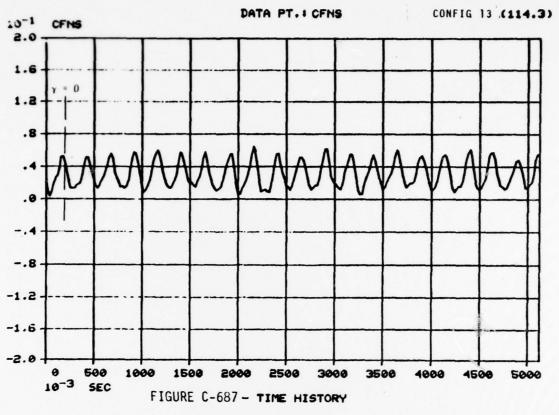


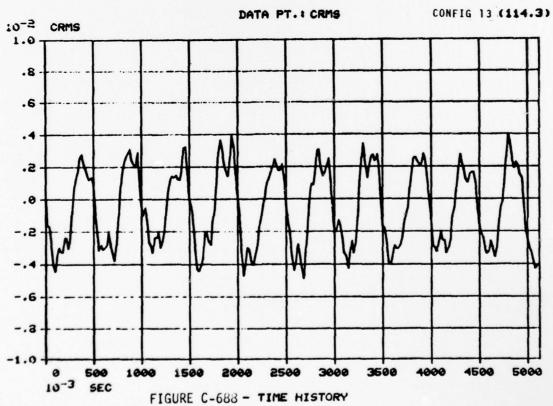
CONFIG 13 (114.2) DATA PT. : CFNS 10-1 CFNS 2.0 1.6  $\gamma = 0$ 1.2 .8 .0 -.8 -1.2 -1.6 -2.0 9 500 1000 1500 2000 2500 3000 3600 4000 4500 10-3 SEC

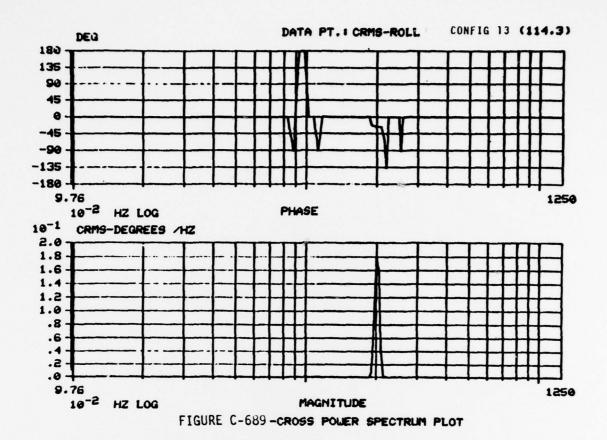
FIGURE C-684 - TIME HISTORY











DATA PT.: CFNS CONFIG 13 (114.4)

1.6

1.2

-.8

-1.2

-1.6

FIGURE C-690 - TIME HISTORY

3000

3500 4000

4500

5000

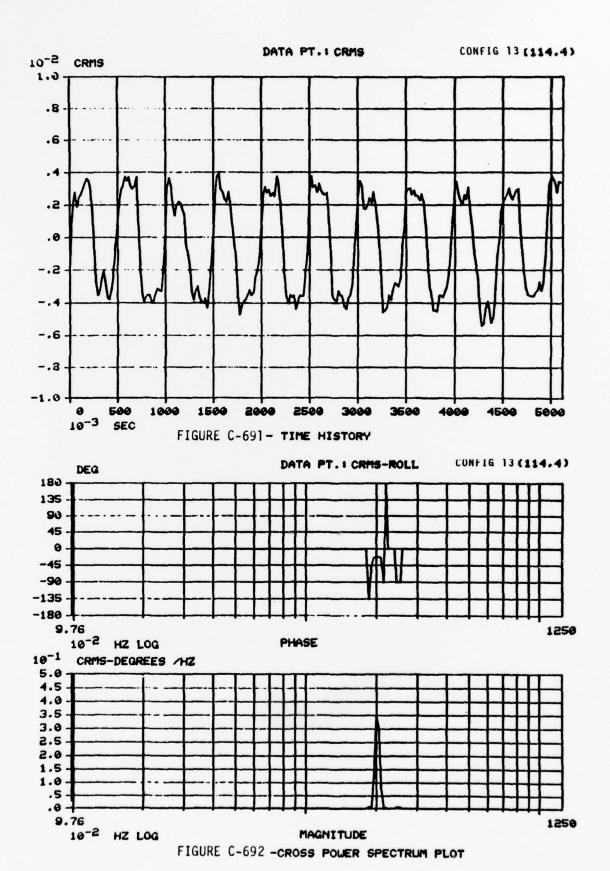
1000 1500 2000 2500

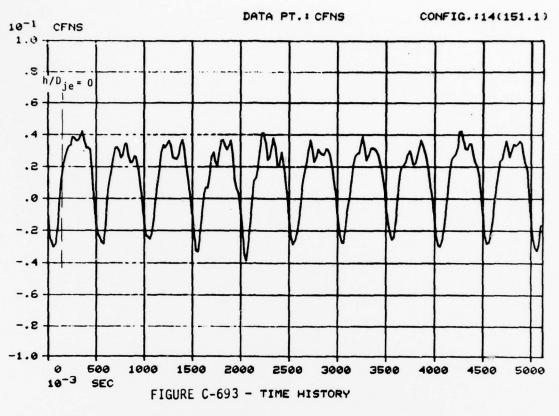
-2.0-

0

500

10-3 SEC





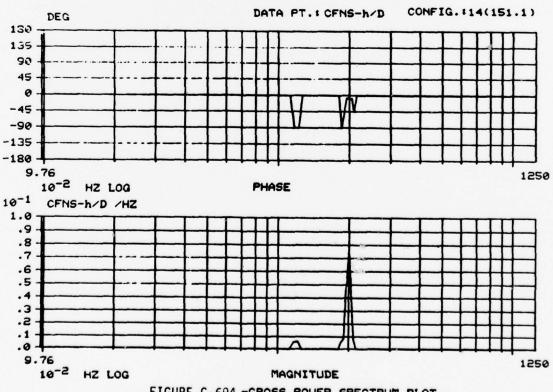
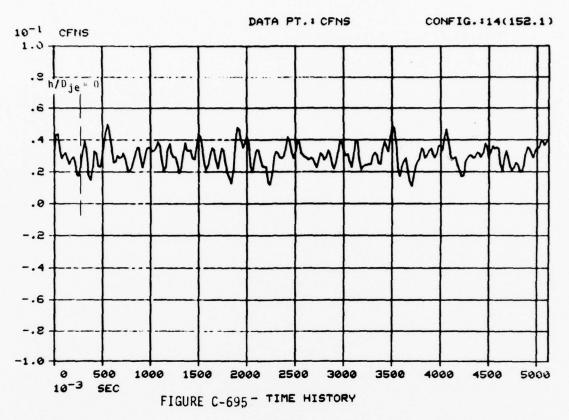
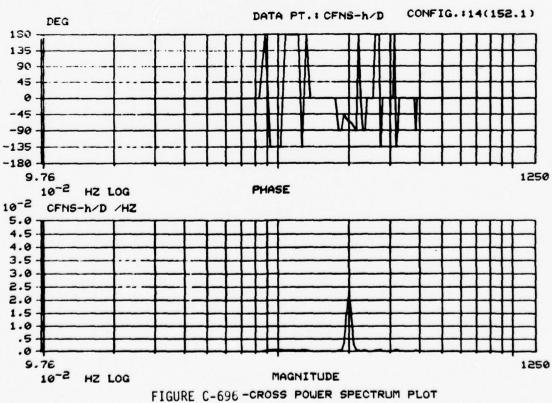
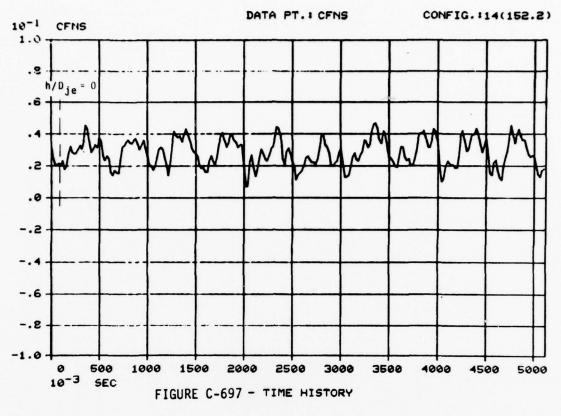
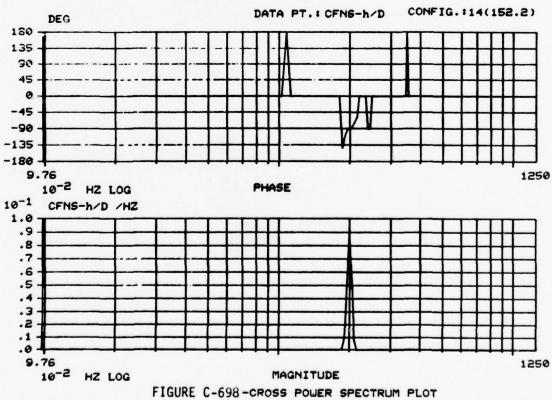


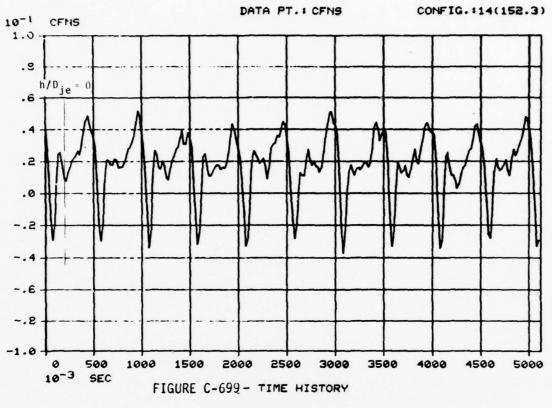
FIGURE C-694 -CROSS POWER SPECTRUM PLOT











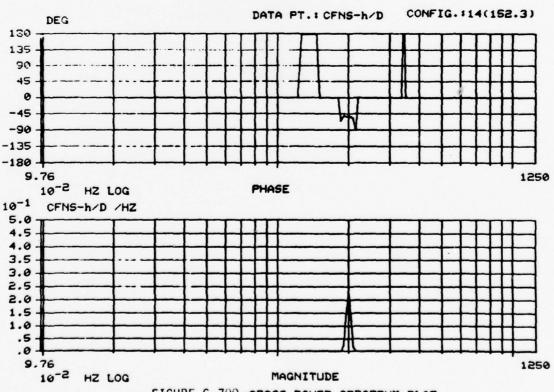
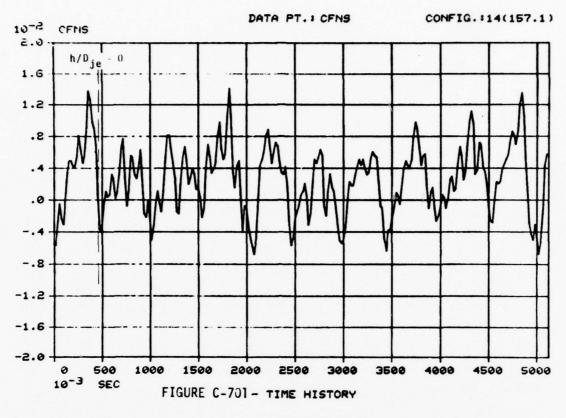


FIGURE C-700-CROSS POWER SPECTRUM PLOT



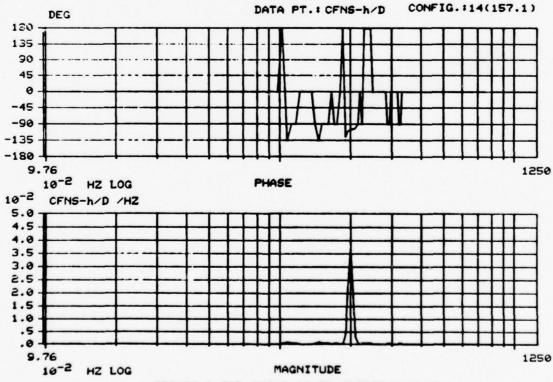
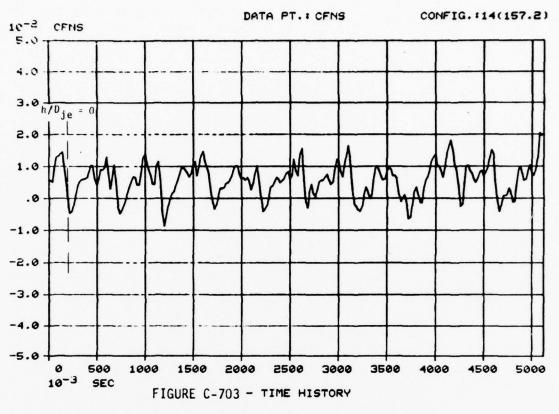


FIGURE C-702-CROSS POWER SPECTRUM PLOT



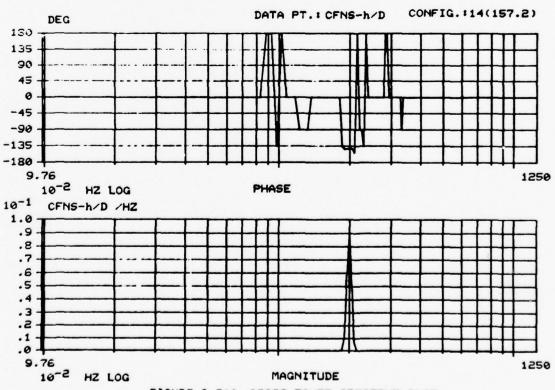
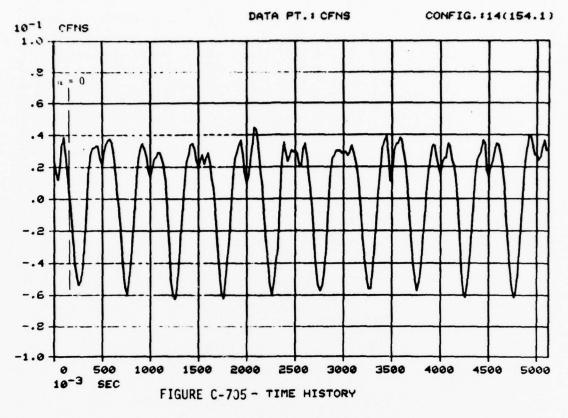
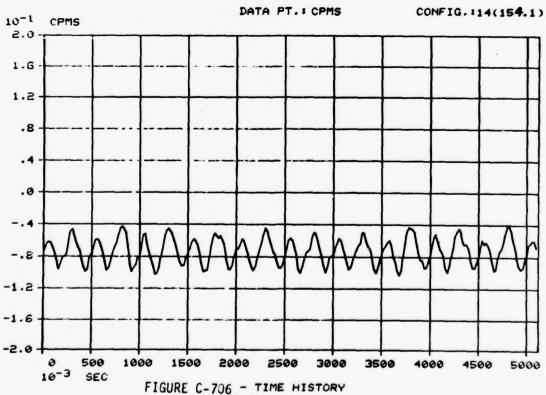
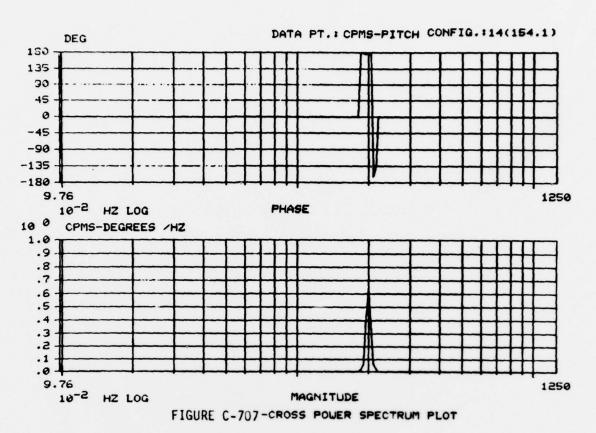


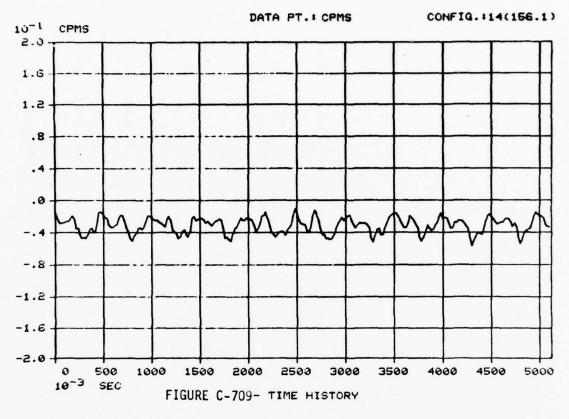
FIGURE C-704 -CROSS POWER SPECTRUM PLOT

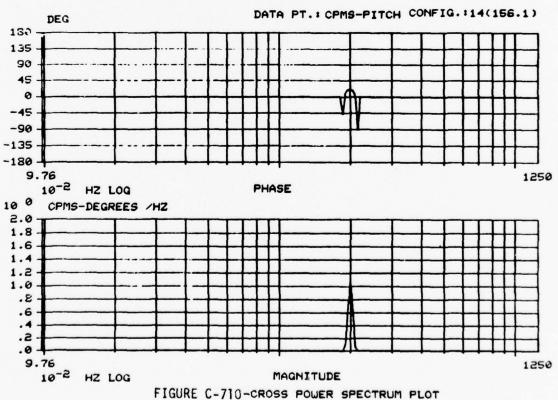


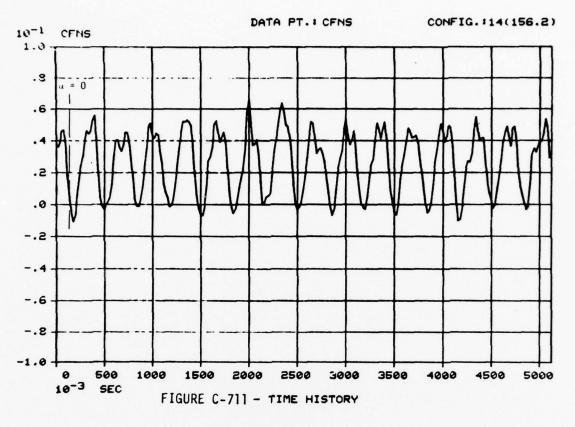


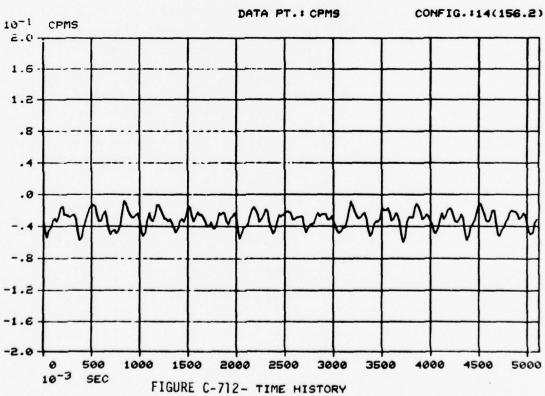


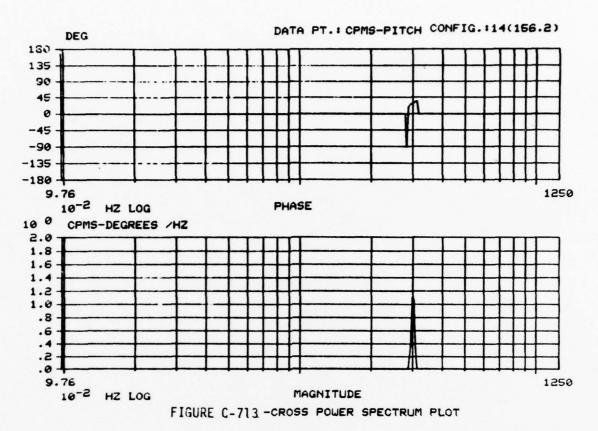
DATA PT. : CFNS CONFIG. 114(156.1) 10-1 CFNS 1.0 -. 8 .6 -.2. .0 -.2 -.6 3.--1.0-500 1500 2000 2500 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-708 - TIME HISTORY

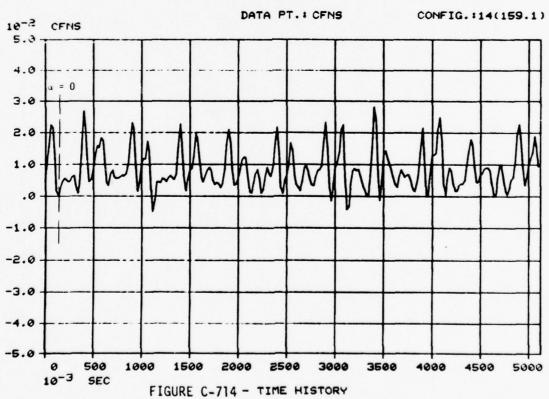


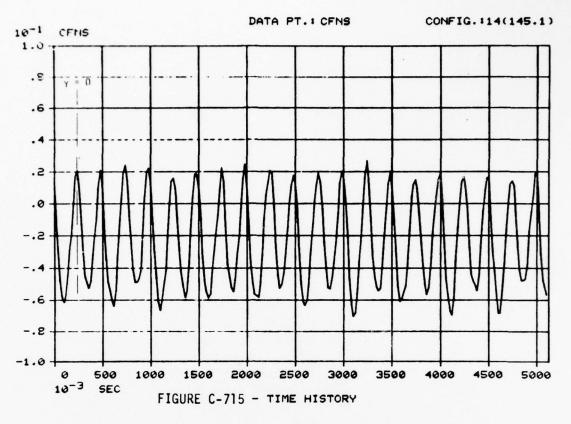


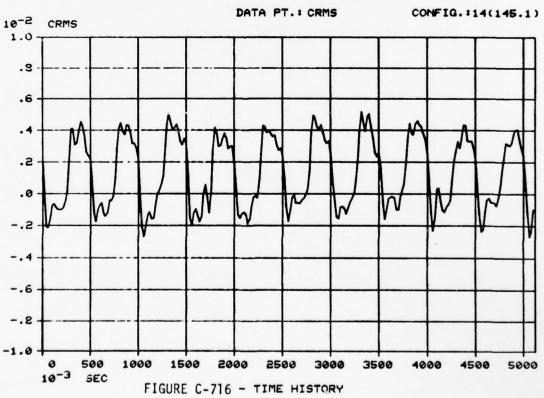


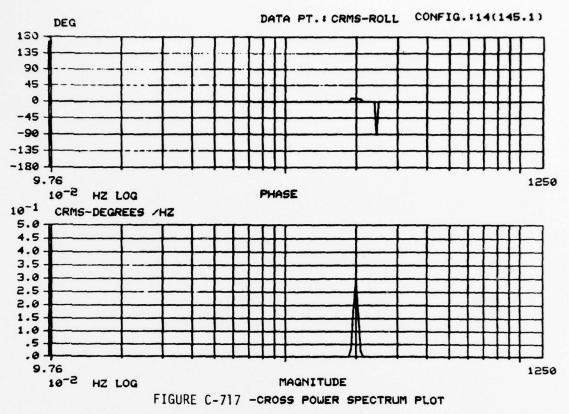


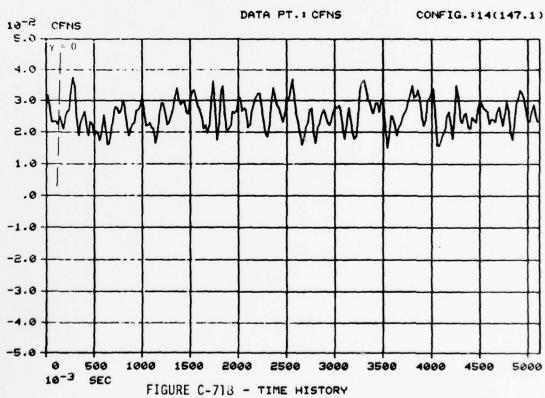


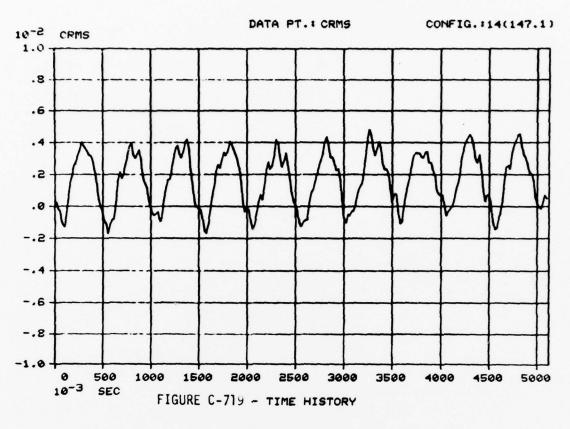


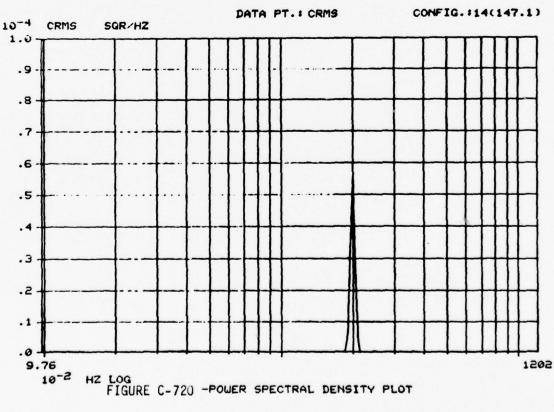


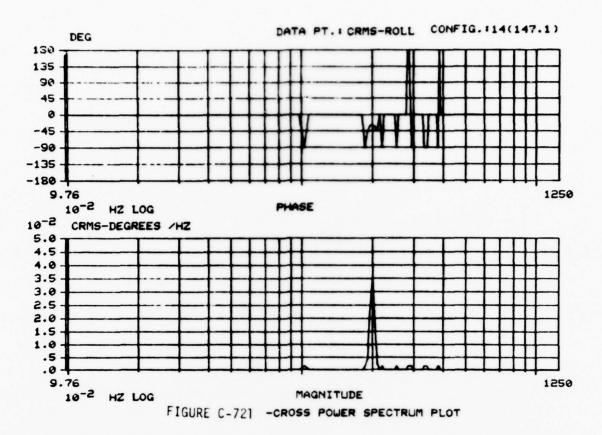


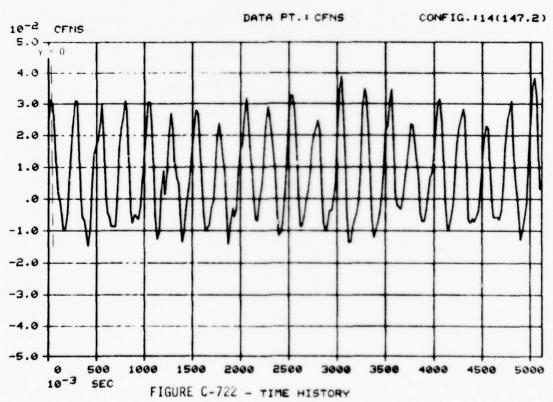


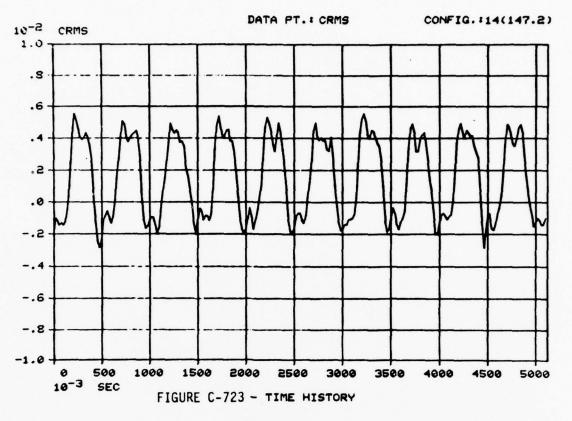


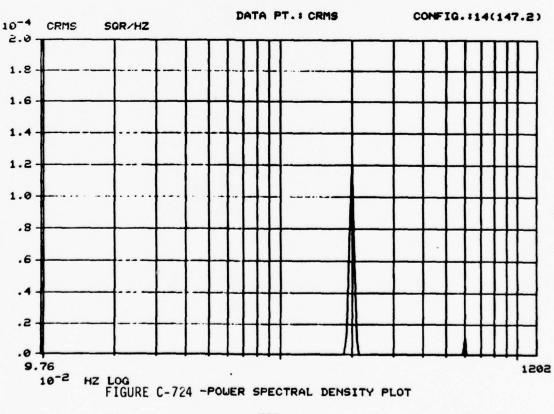


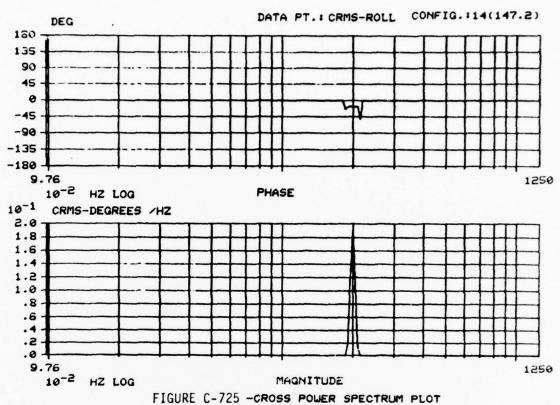




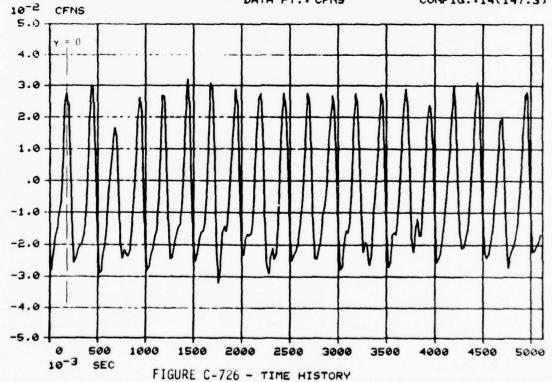


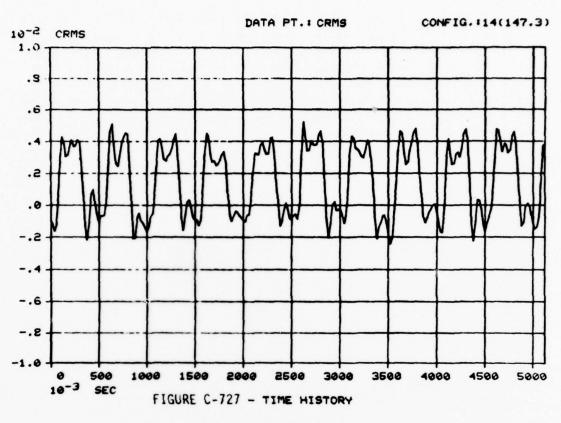


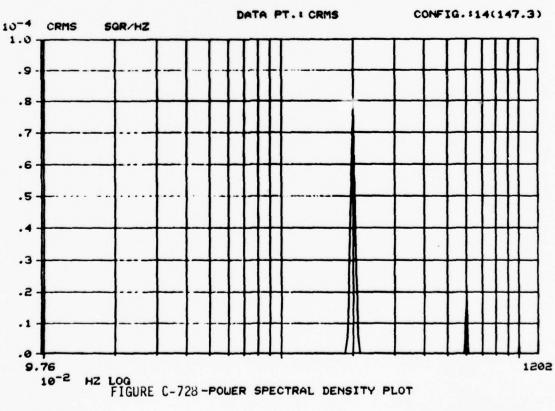


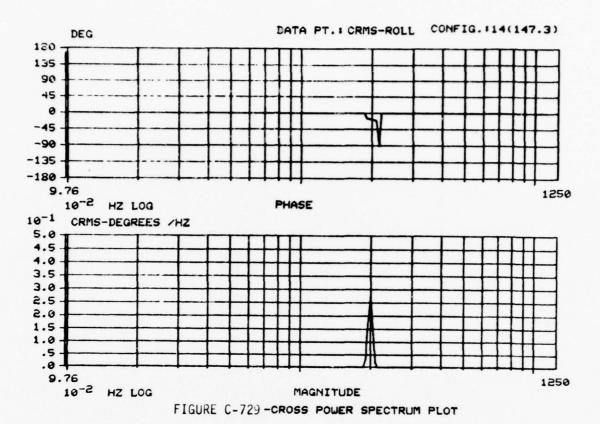


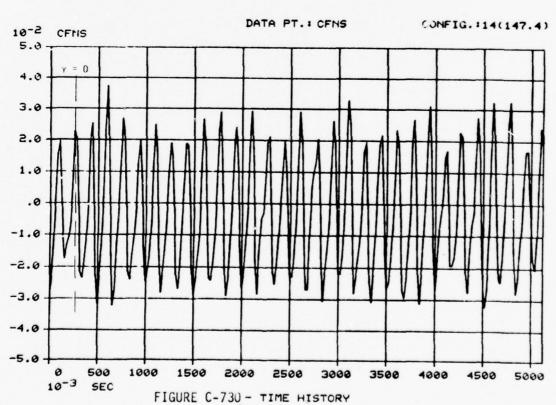


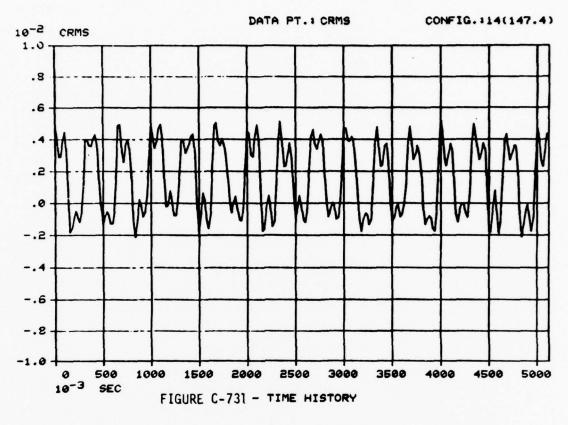


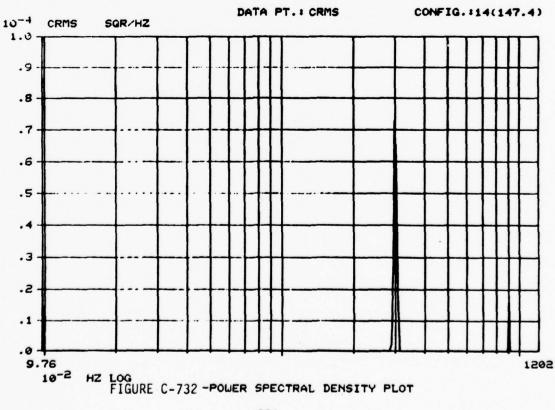


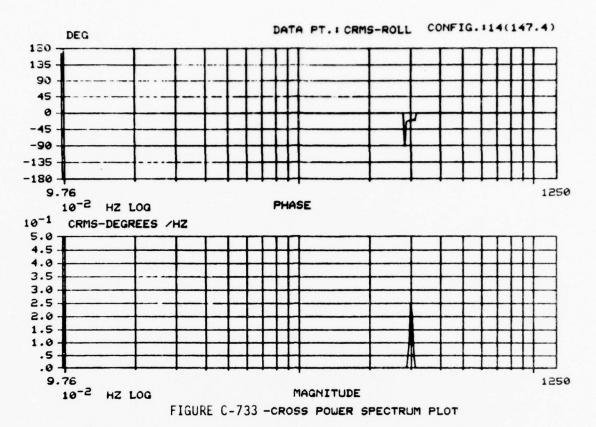


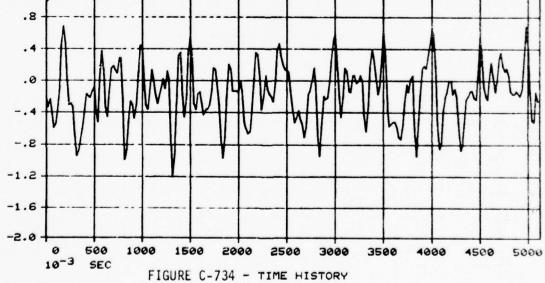


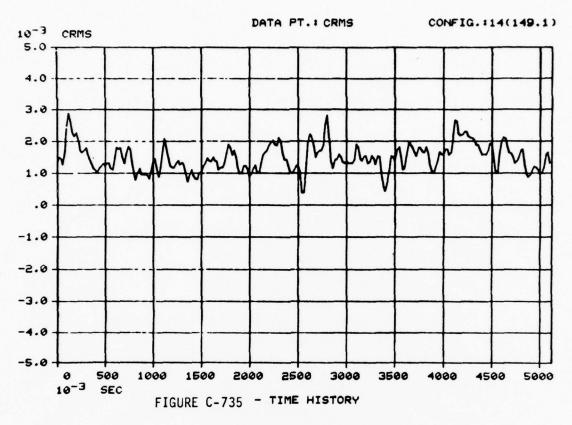


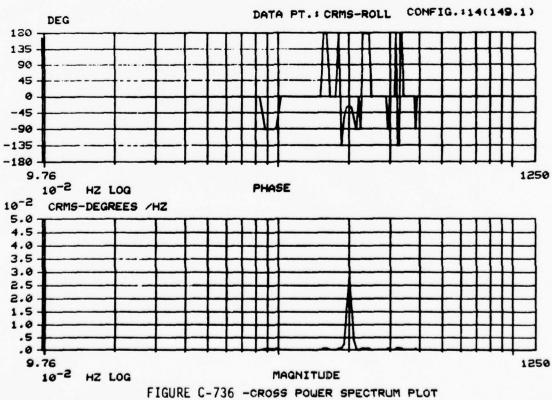


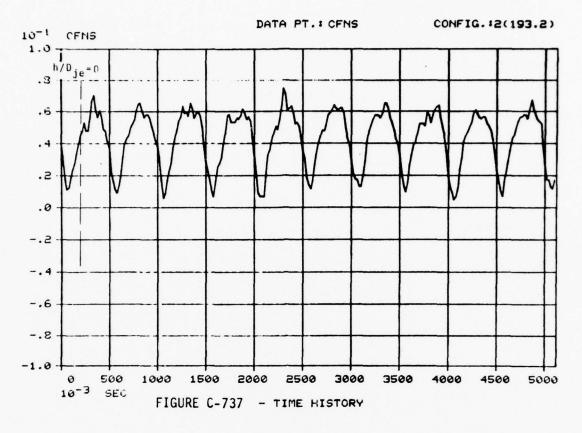


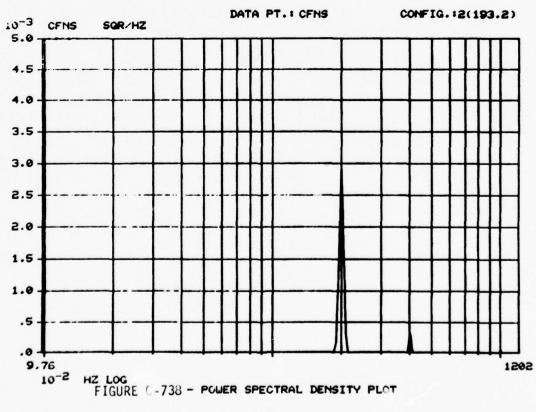


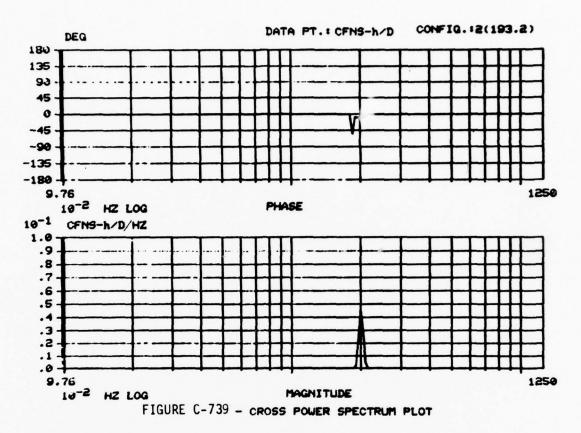


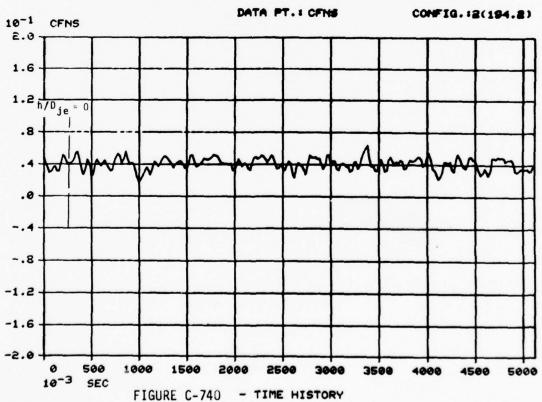


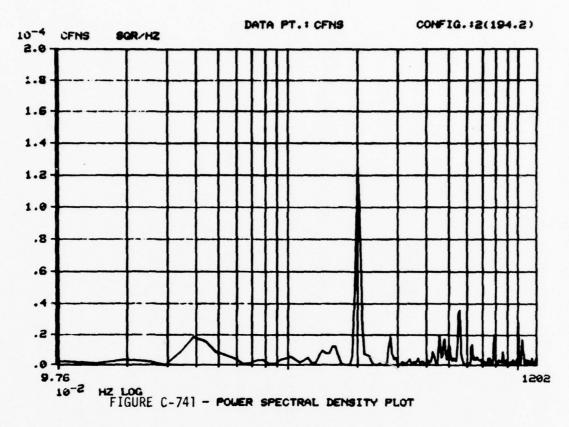


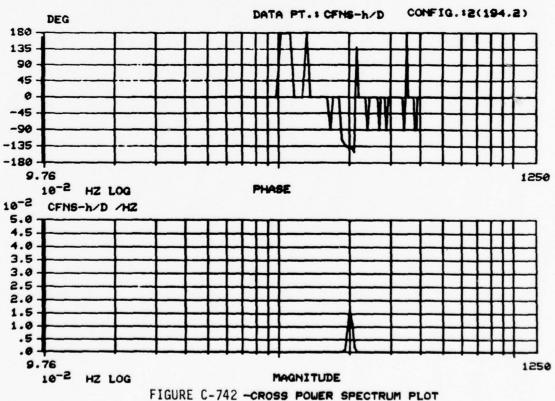


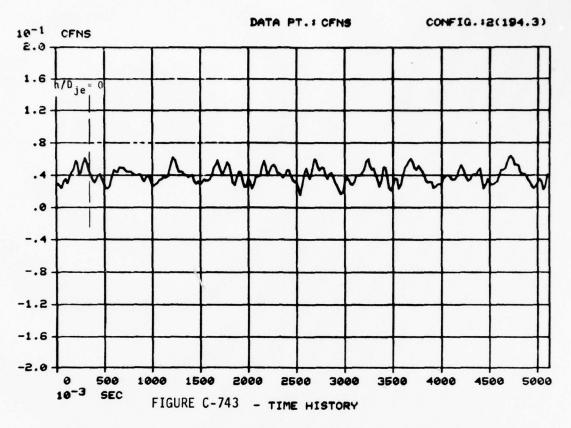


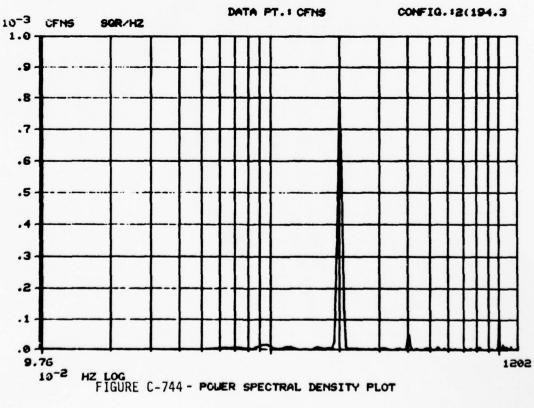


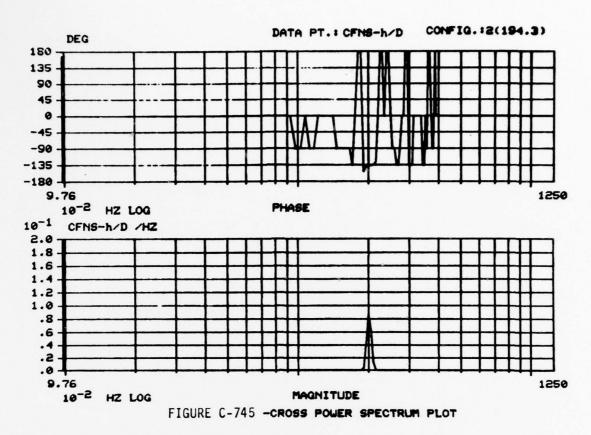


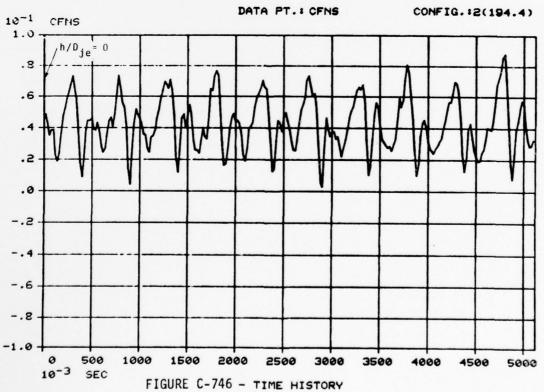


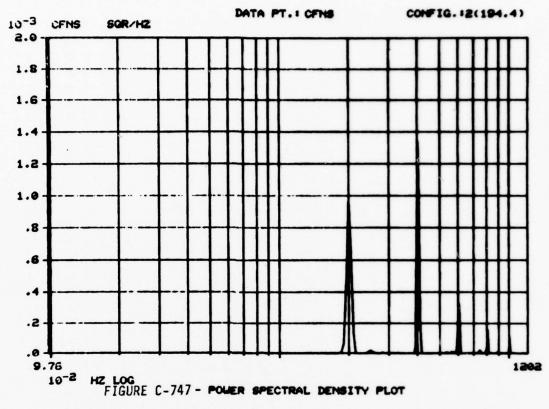


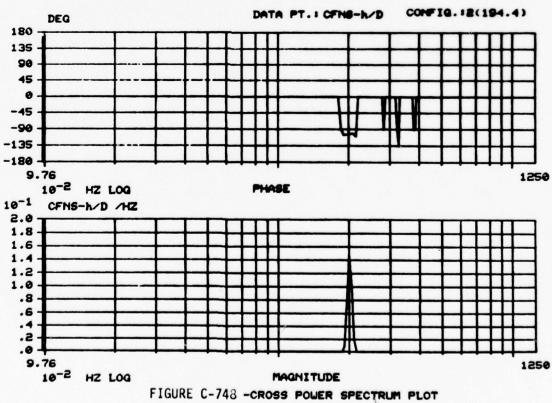


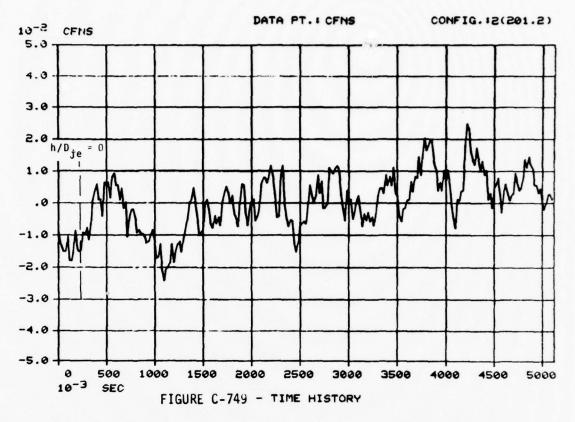


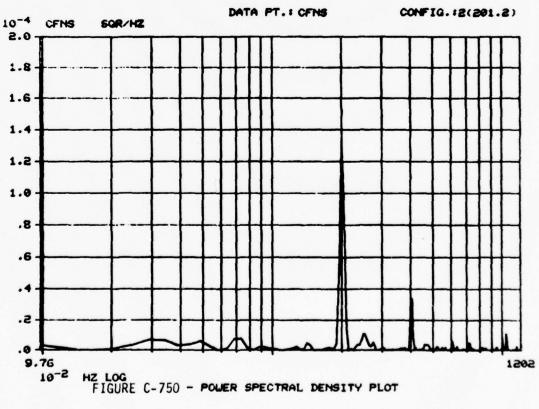


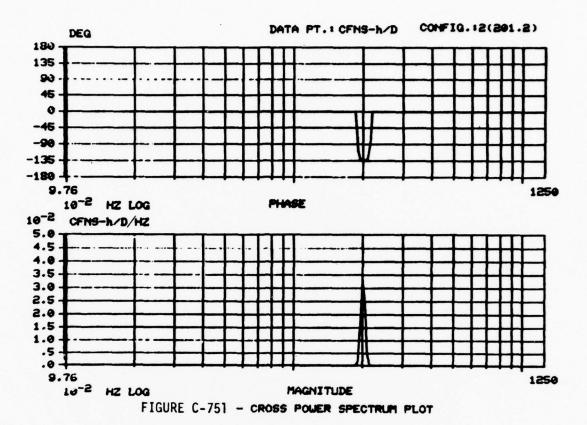


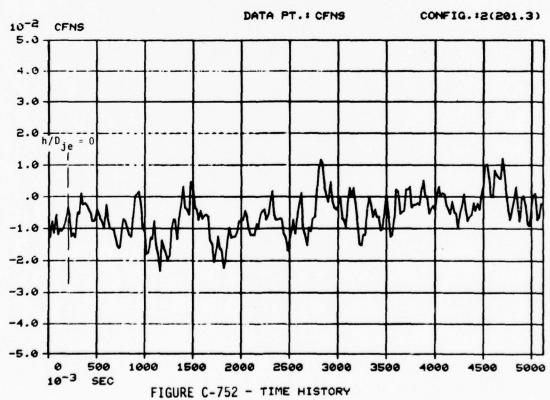


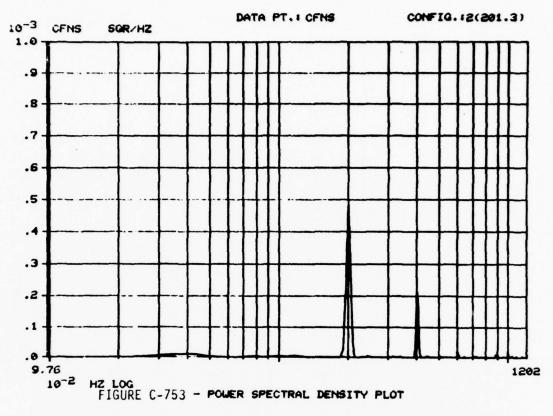


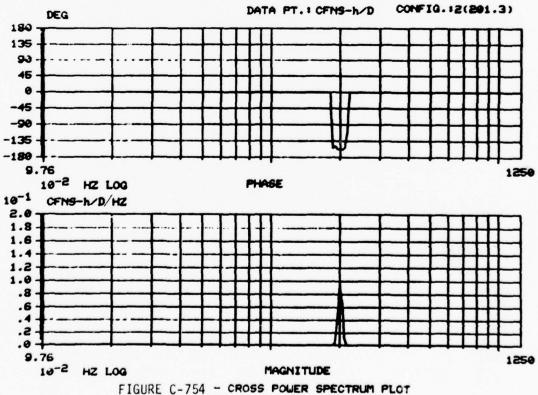


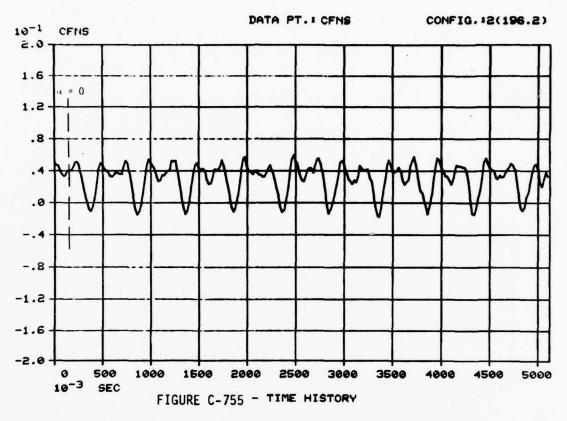


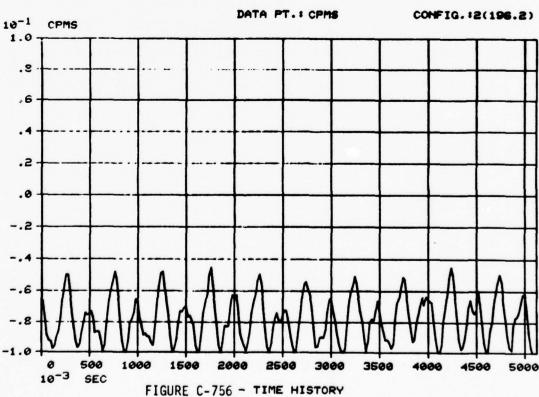


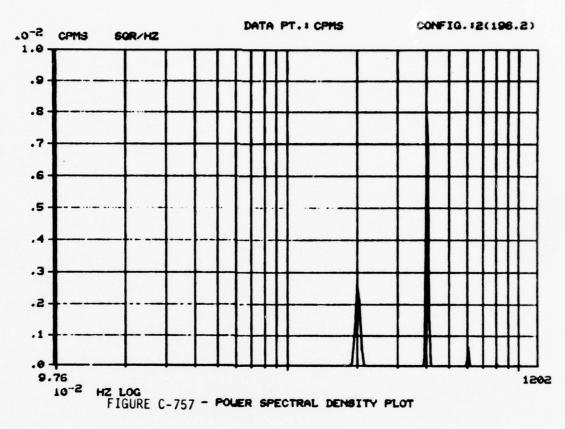


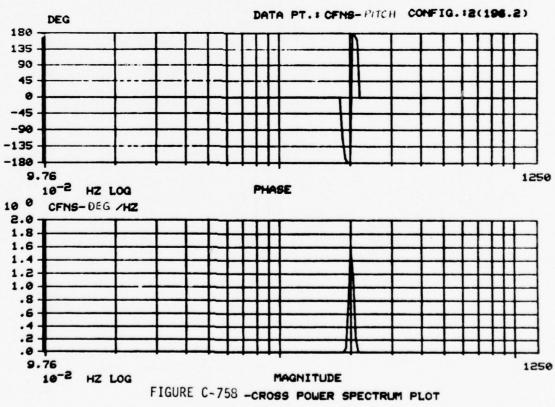


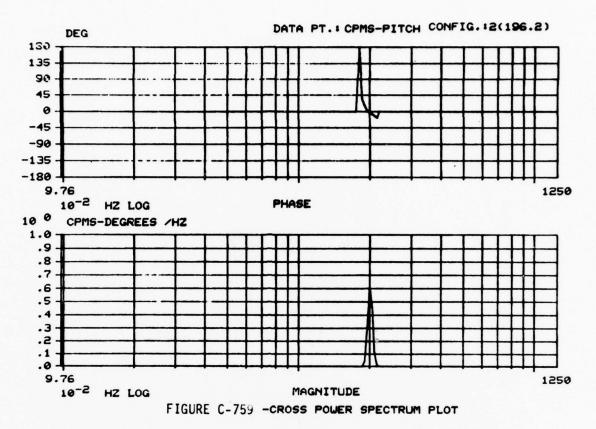


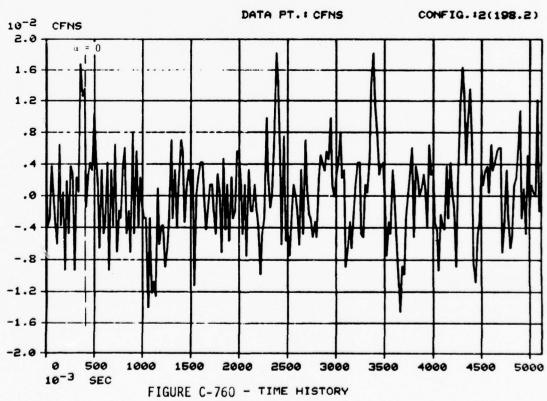


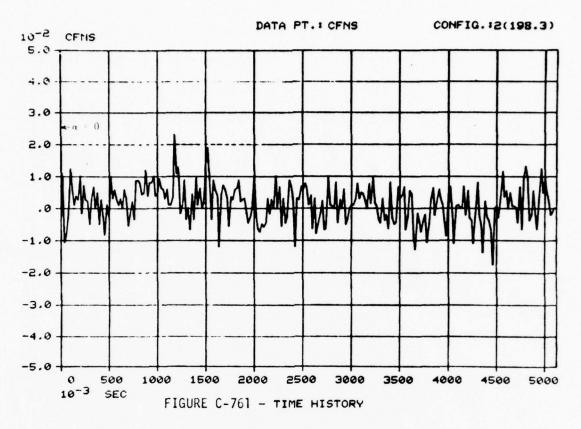


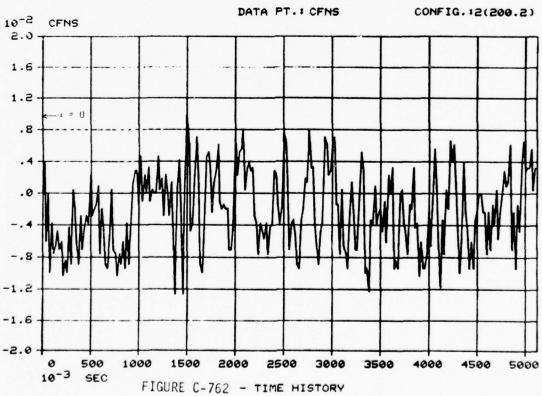


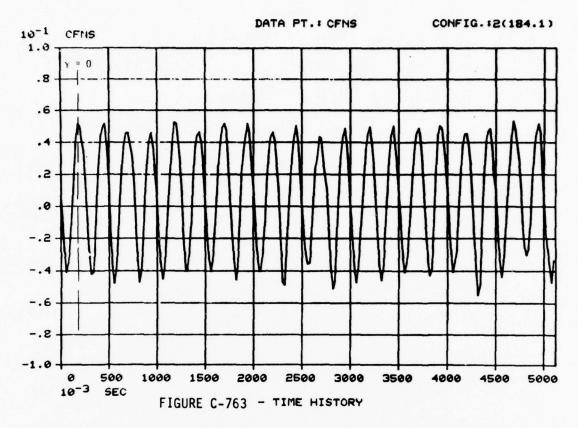


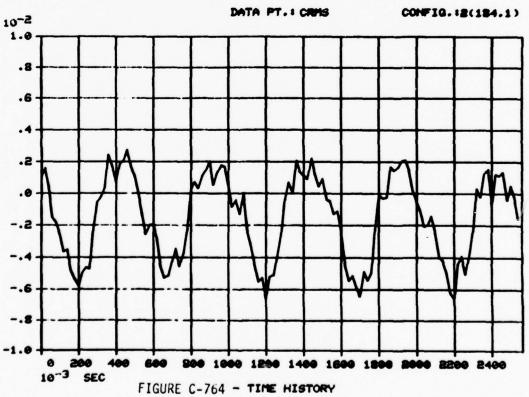


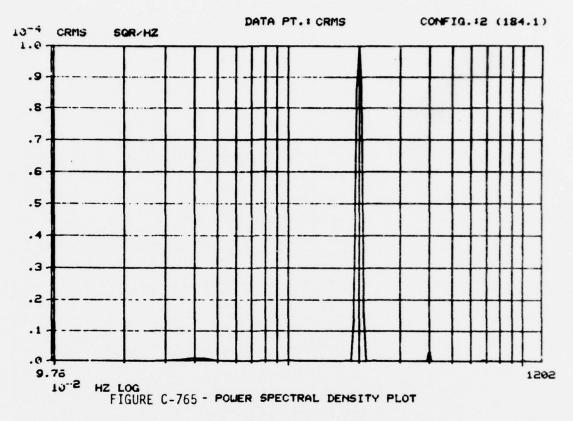


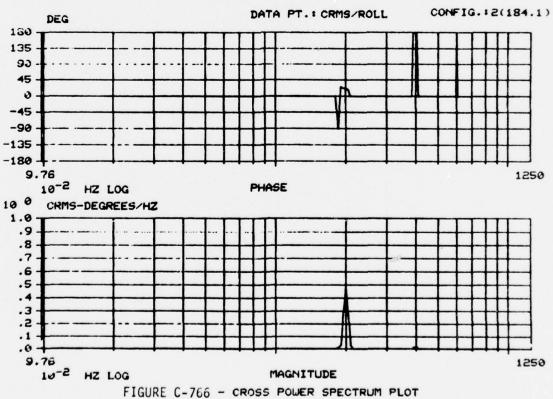


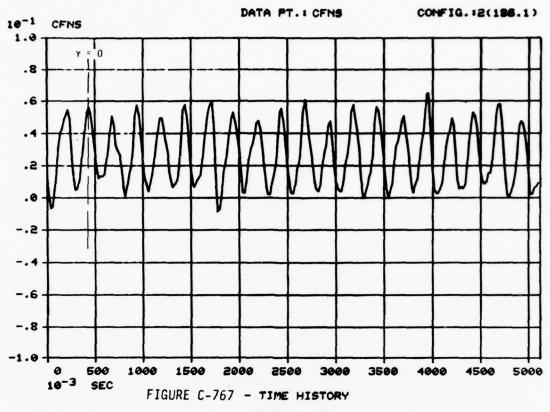


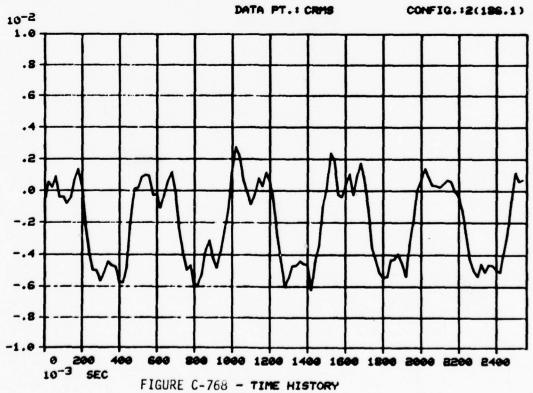


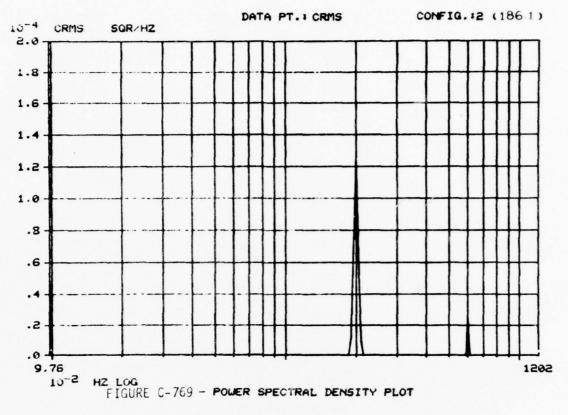


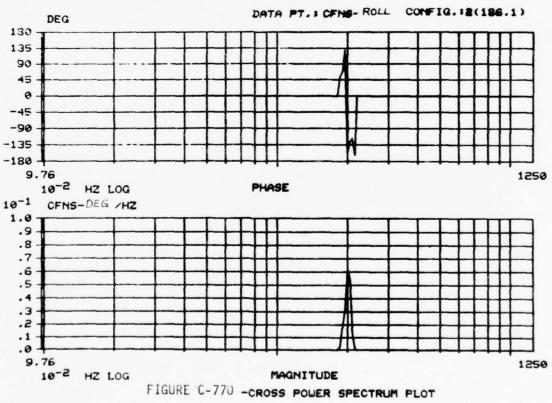


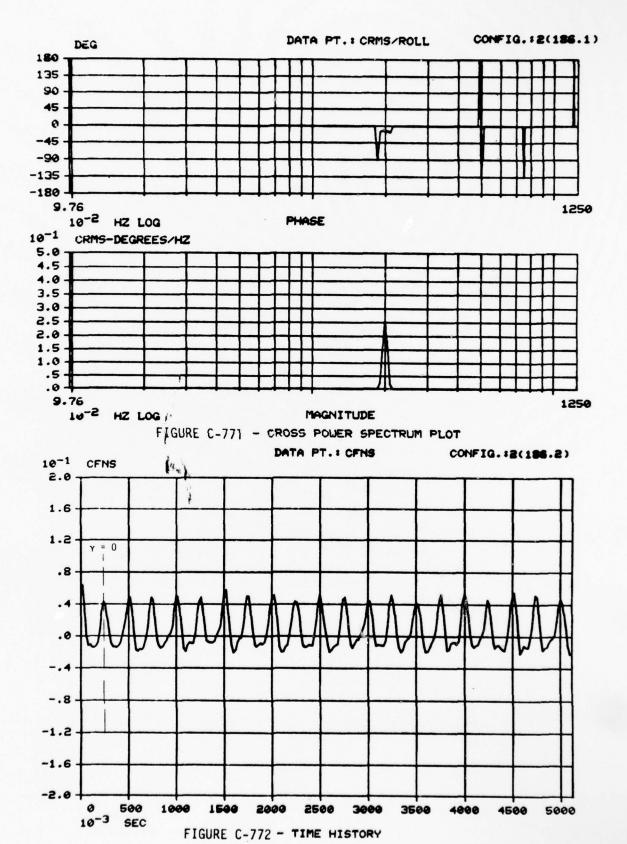


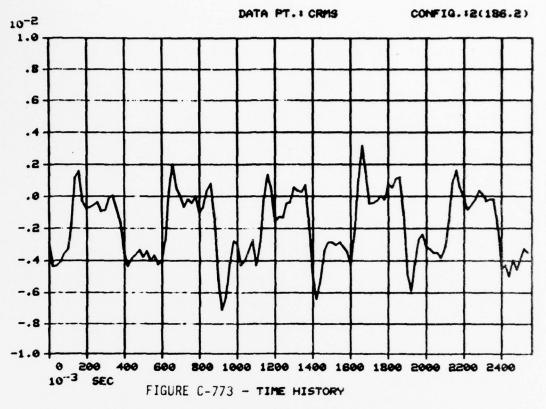


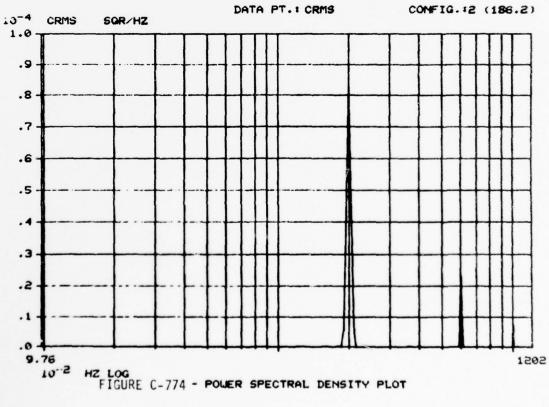


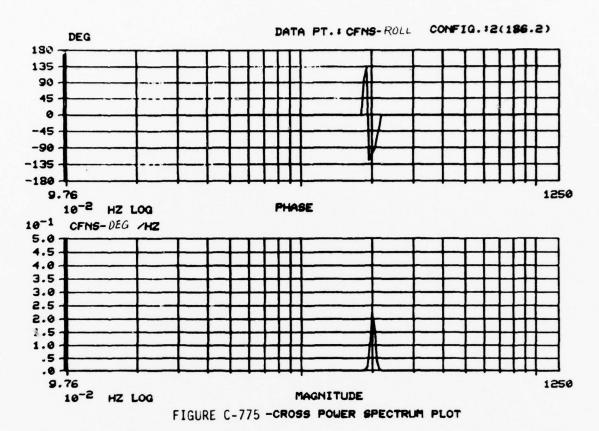


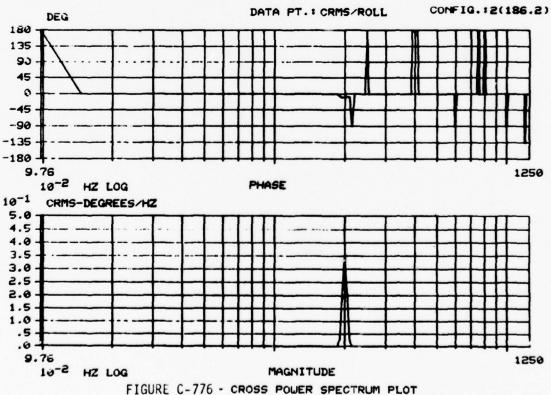


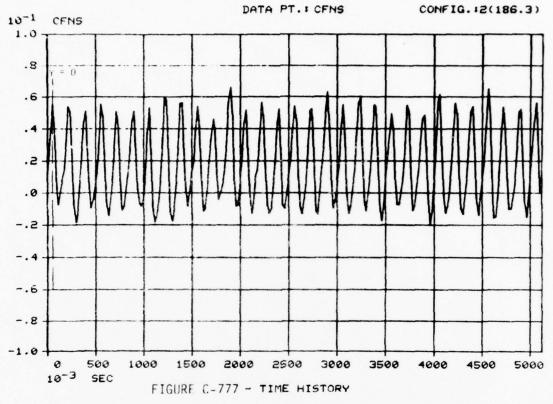


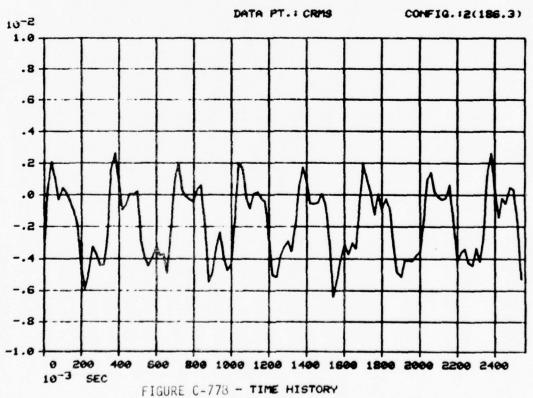


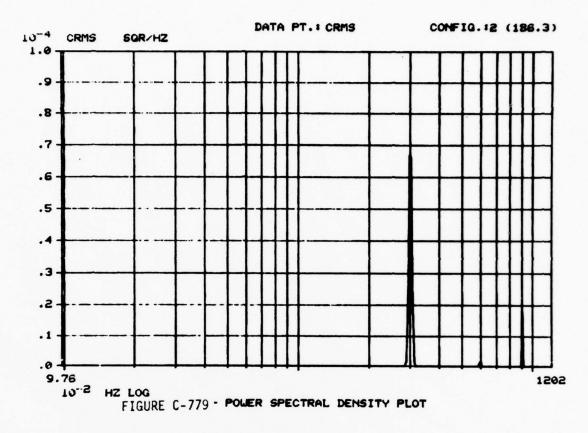


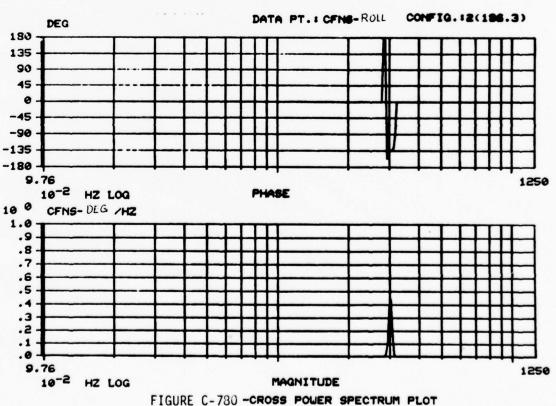












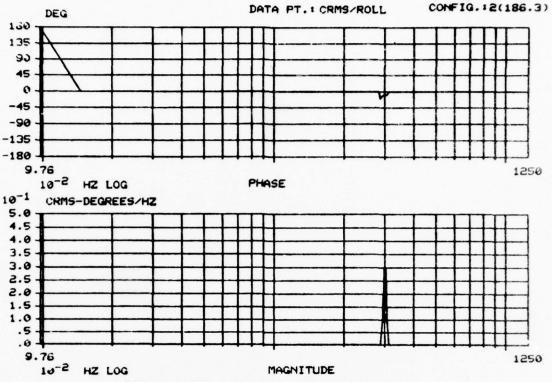
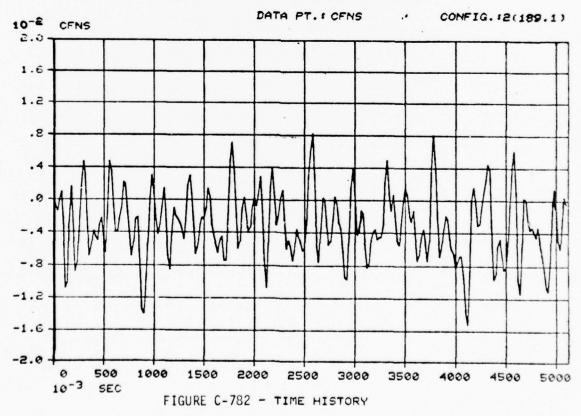
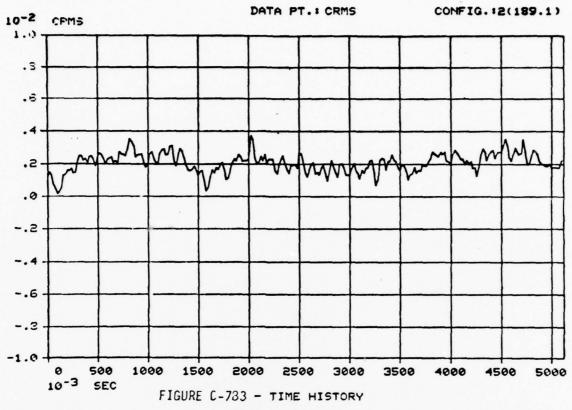
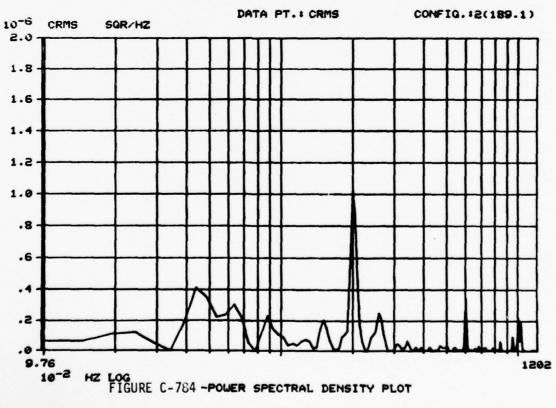
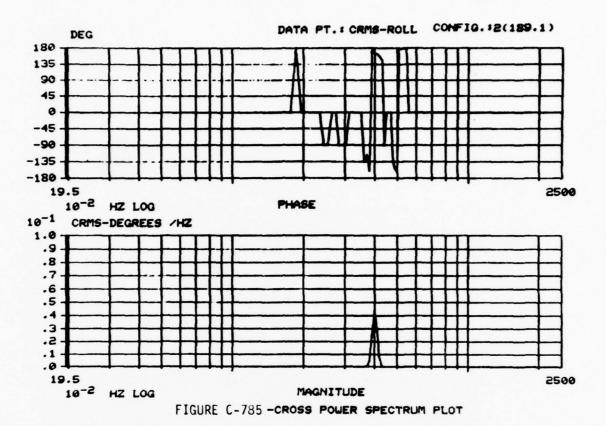


FIGURE C-781 - CROSS POWER SPECTRUM PLOT









1.6
1.6
1.2
1.7 = 0
1.8
-.4
-.8

2500

3000

3500

4000

5000

2000

FIGURE C-786 - TIME HISTORY

1500

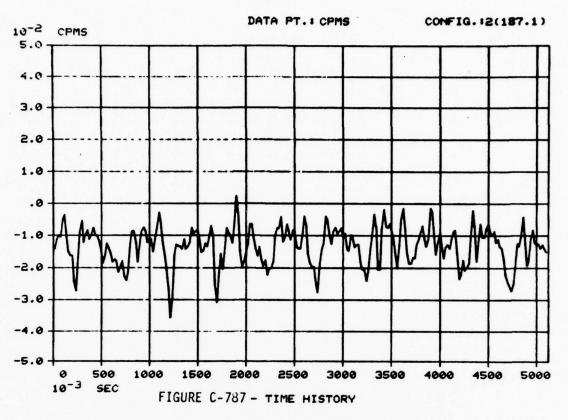
-1.2

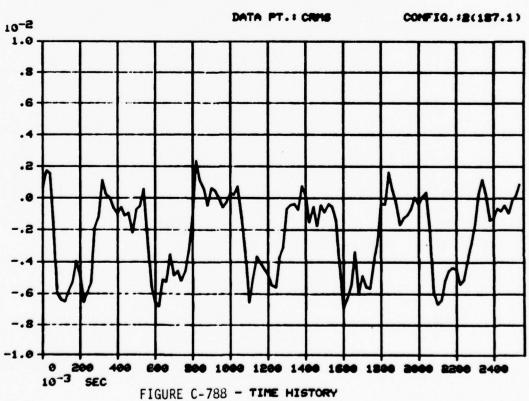
-1.6

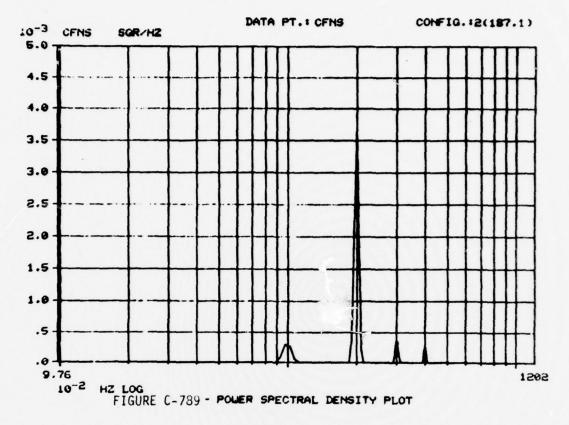
-2.0

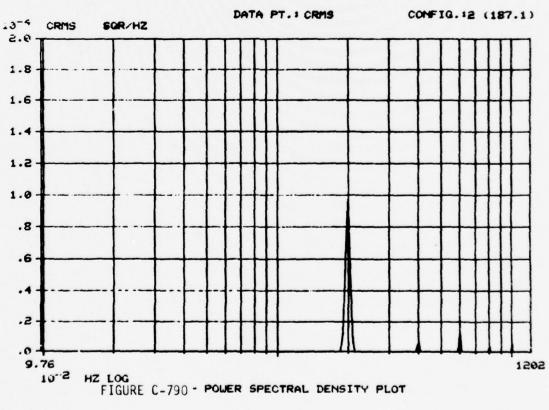
500

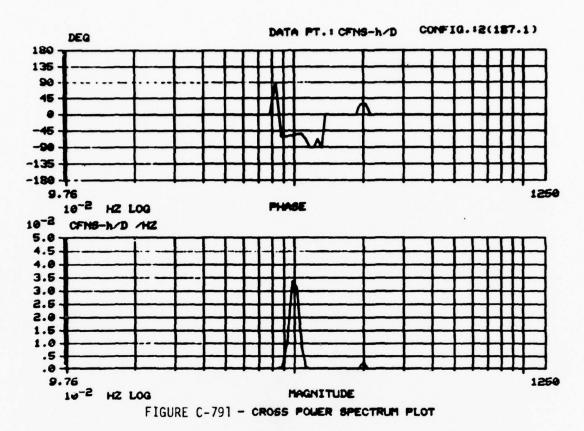
10-3 SEC











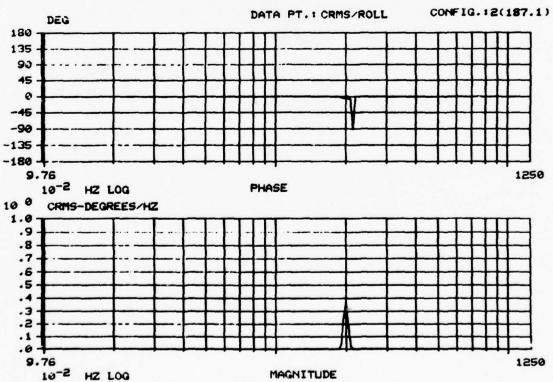
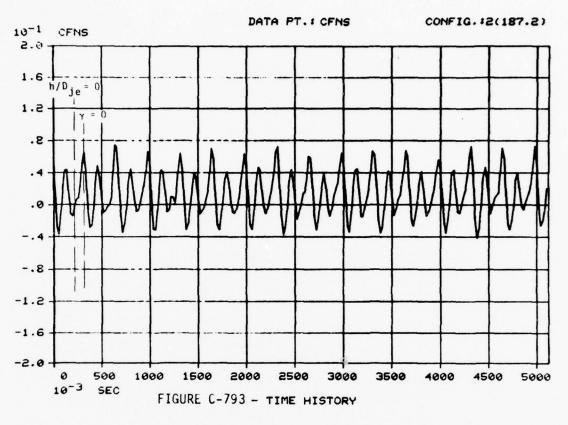
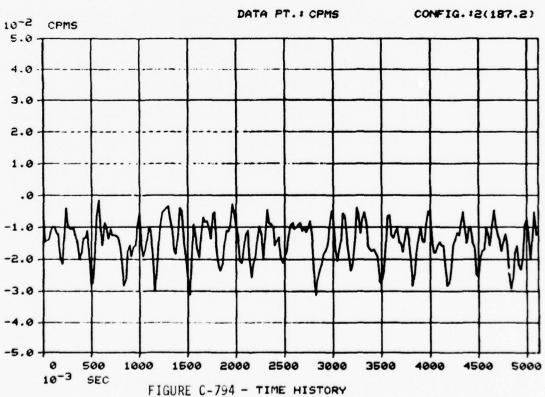
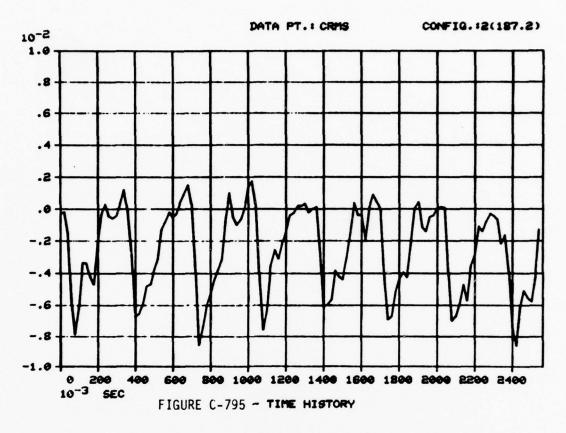
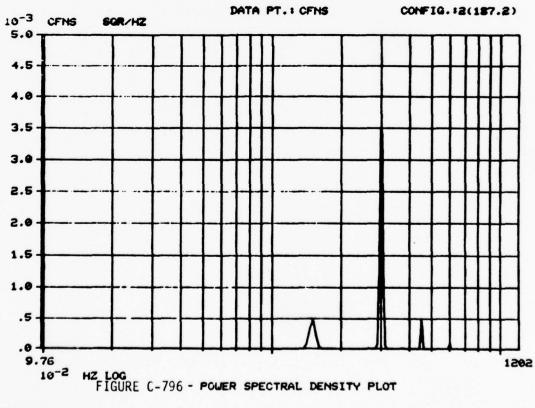


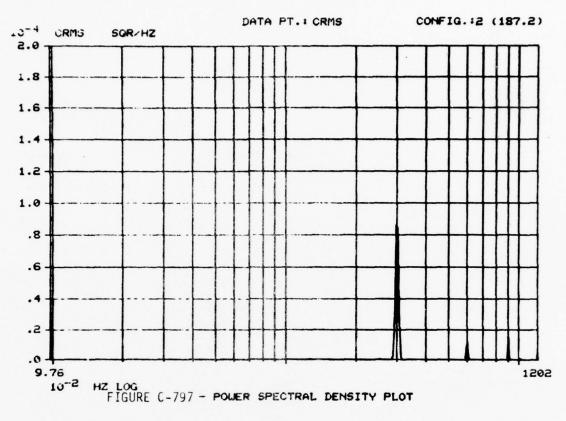
FIGURE C-792 - CROSS POWER SPECTRUM PLOT











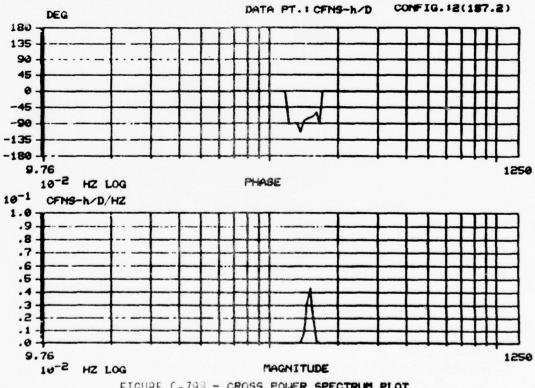
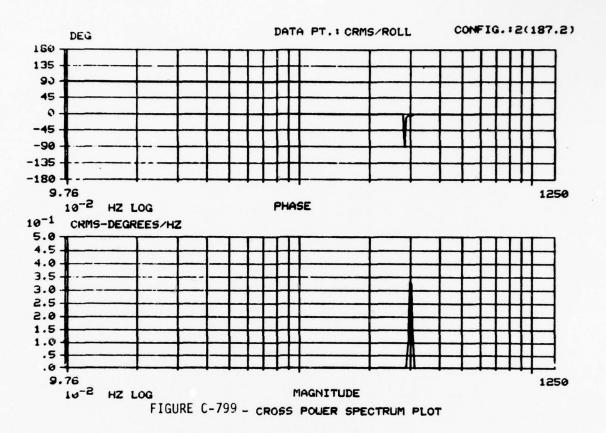
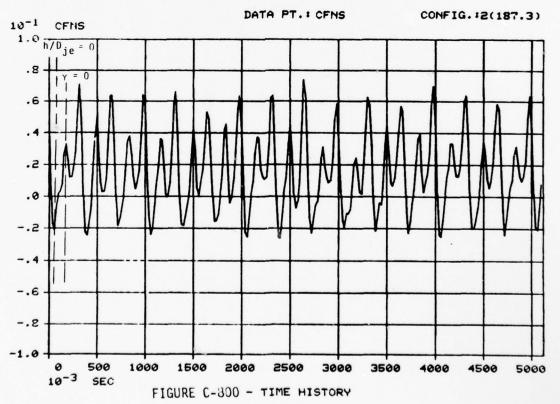
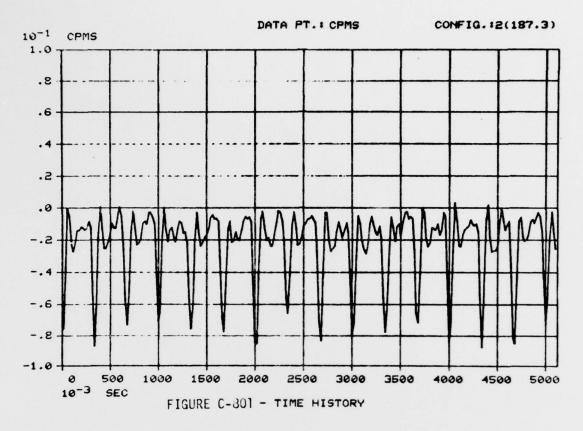
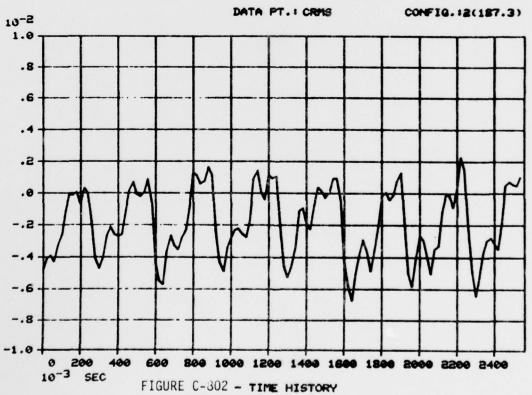


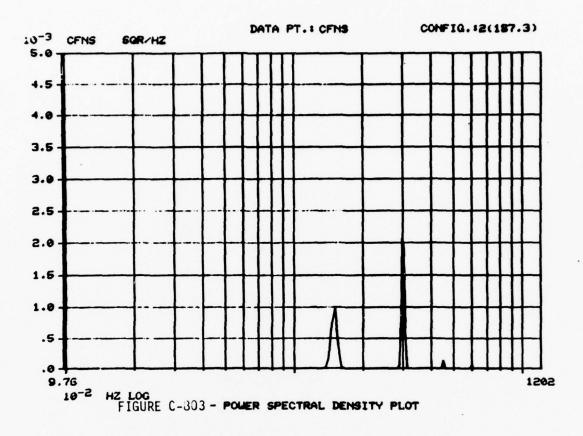
FIGURE C-798 - CROSS POWER SPECTRUM PLOT

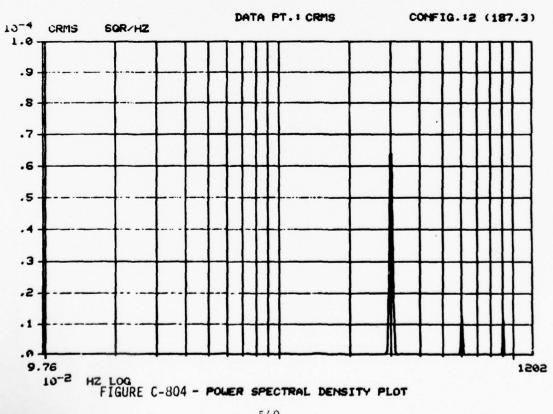


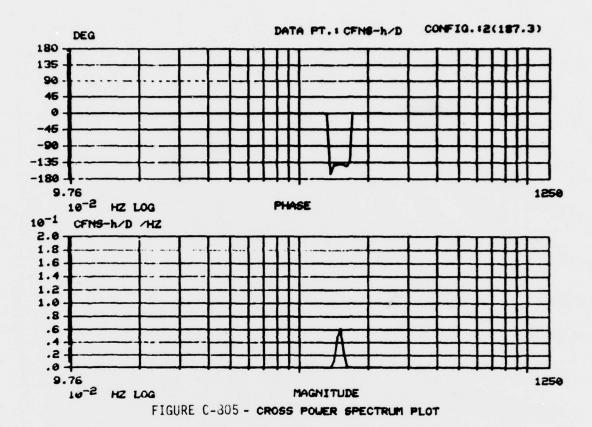












CONFIG.:2(187.3) DATA PT.: CRMS/ROLL DEG 180 135 90 45 0 -45 -90 -135 -180 -9.76 1250 10-2 HZ LOG PHASE 10-1 CRMS-DEGREES/HZ 5.0 -

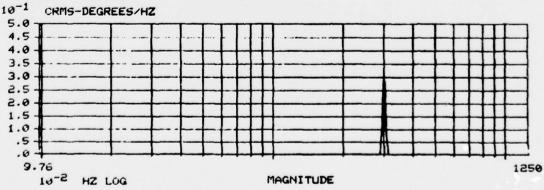
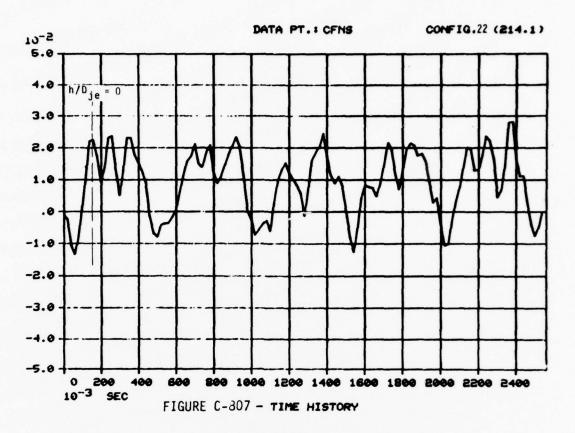
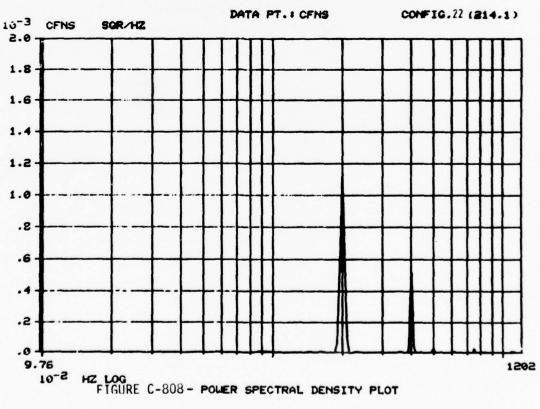
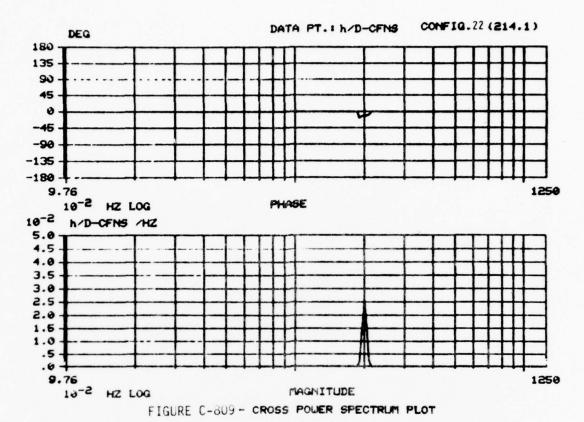
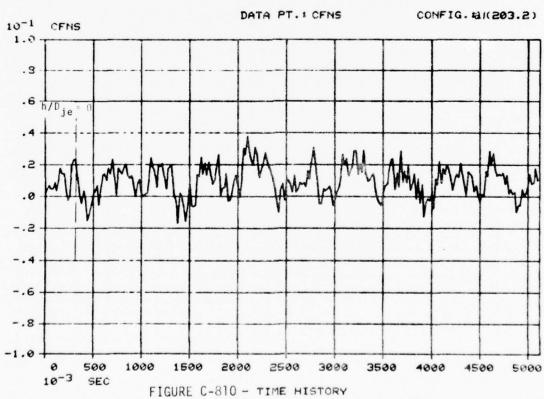


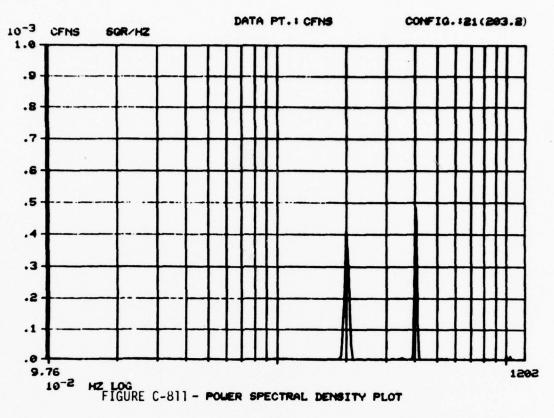
FIGURE C-306 - CROSS POWER SPECTRUM PLOT

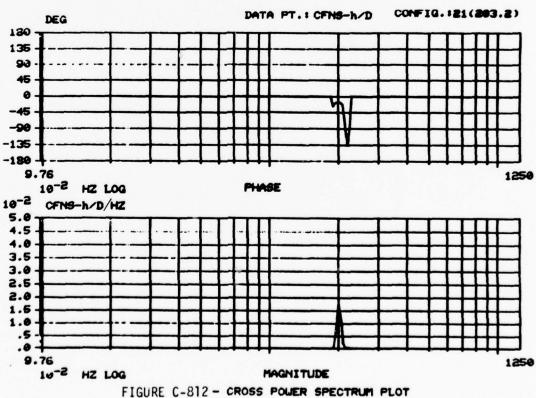


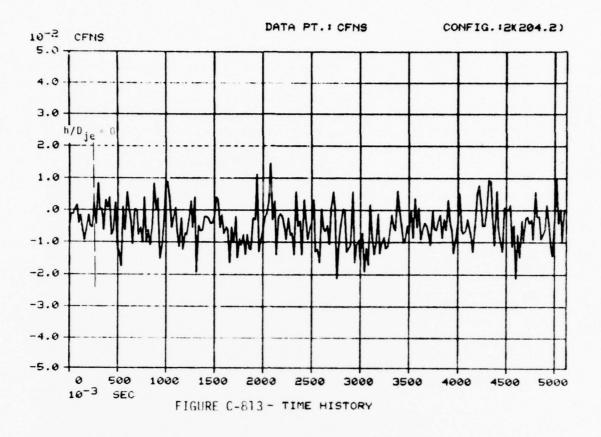


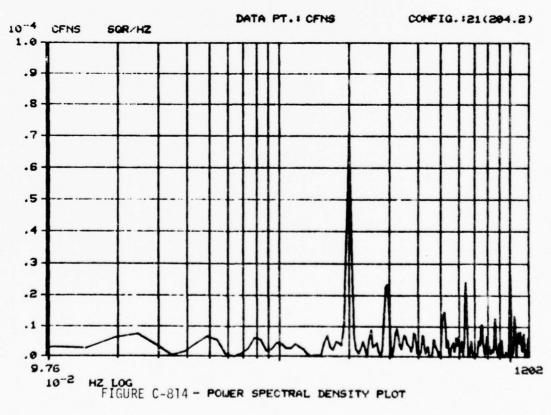


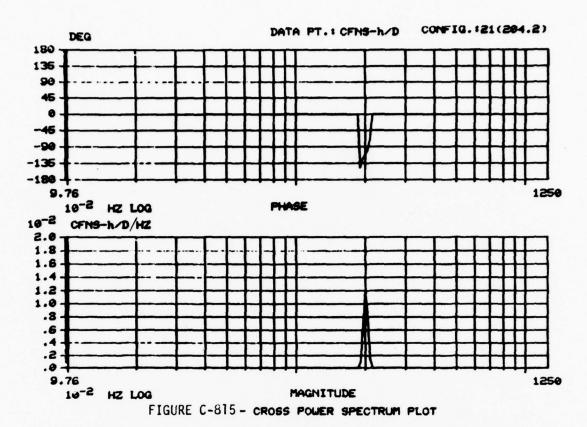


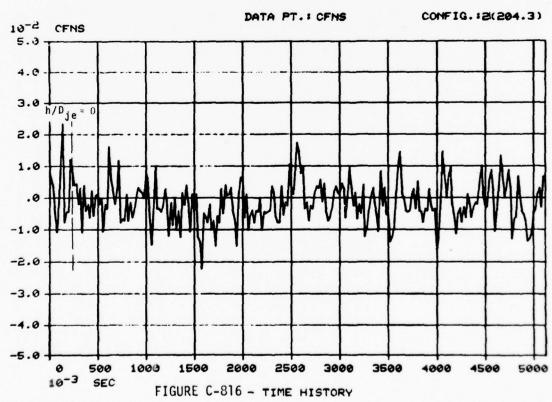


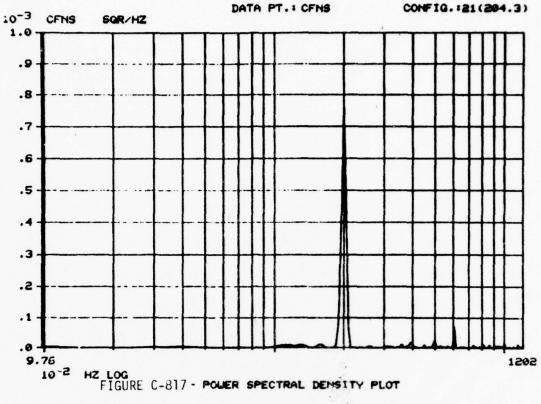


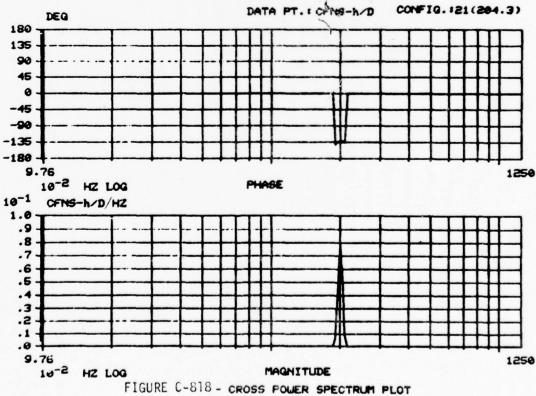


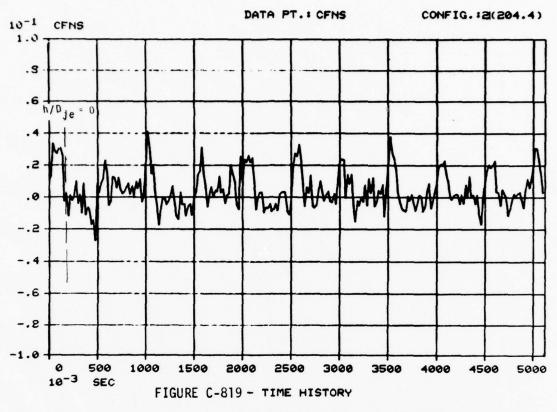


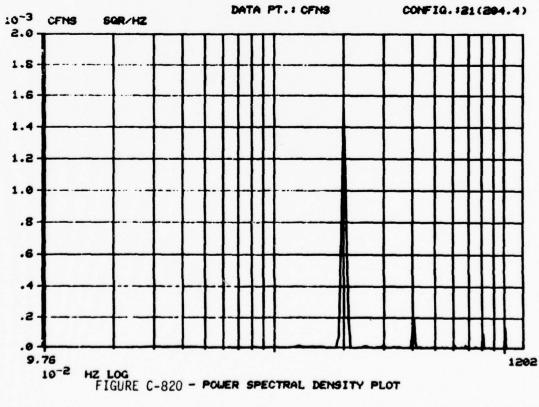


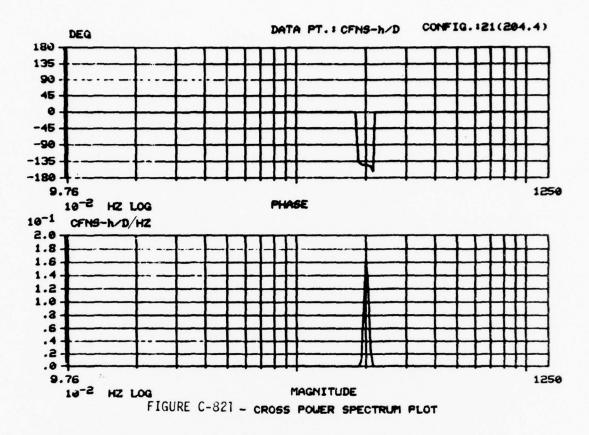


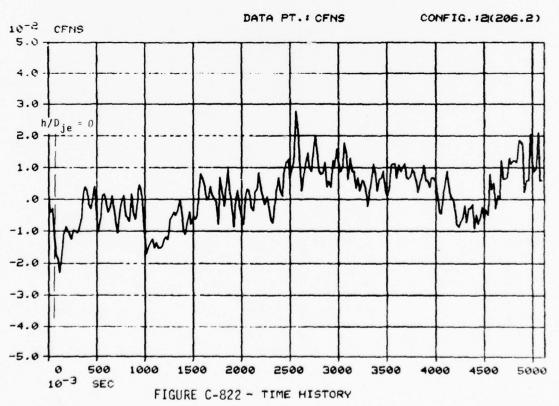


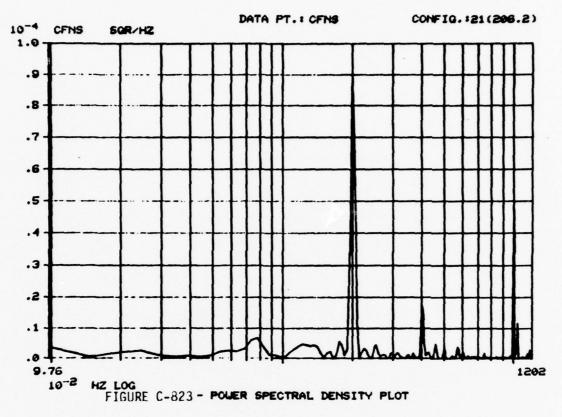


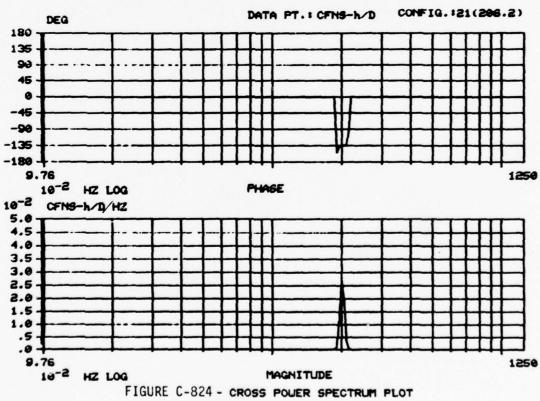


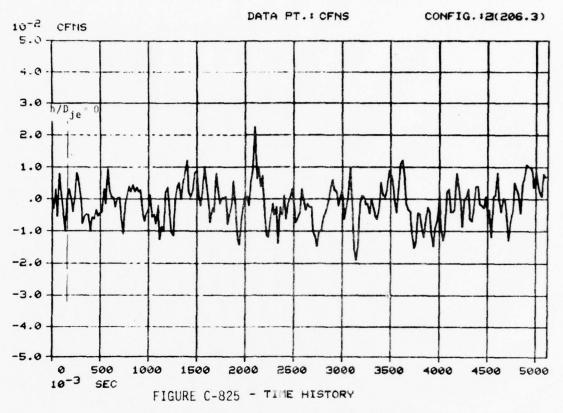


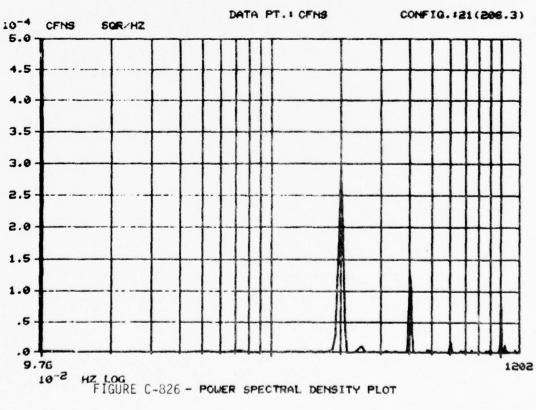


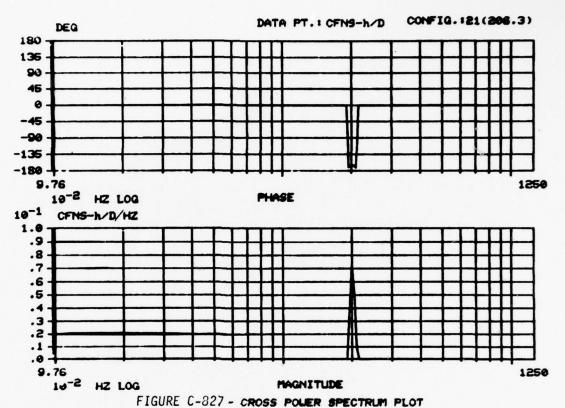




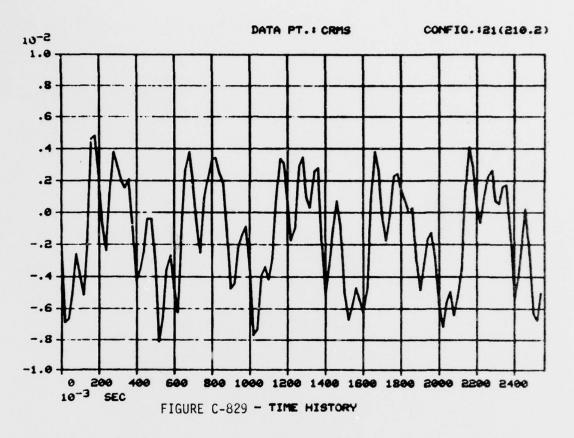


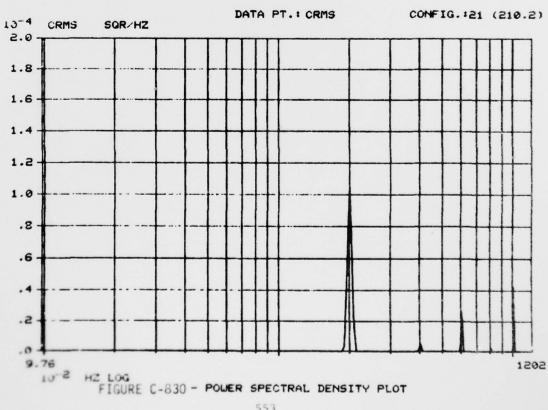






CONFIG.:21(210.2) DATA PT.: CFNS 10-1 CFNS 2.0 7 1.6 1.2 .8 .0 -.4 -.8 -1.2. -1.6 -2.0 -0 500 1000 1500 3500 2000 2500 3000 4000 4500 5000 10-3 SEC FIGURE C-828 - TIME HISTORY





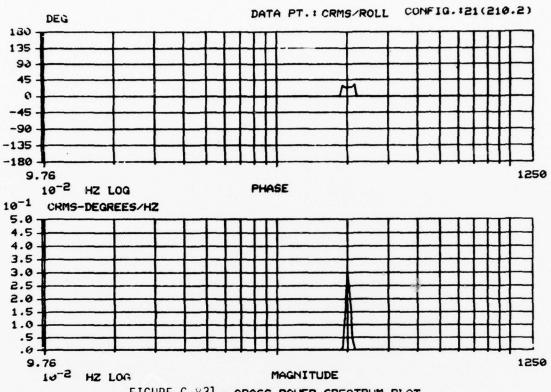
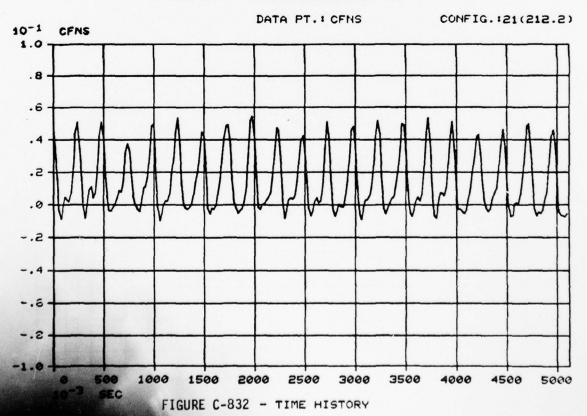
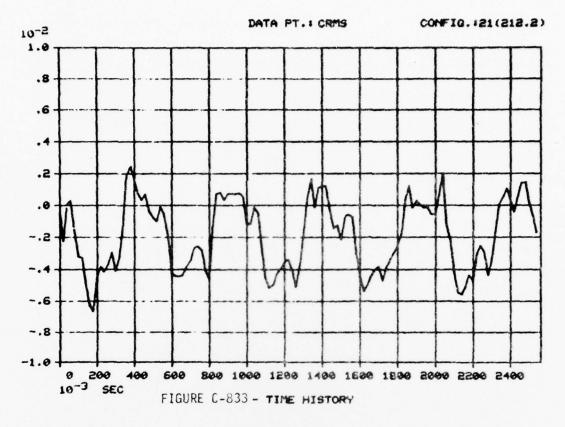
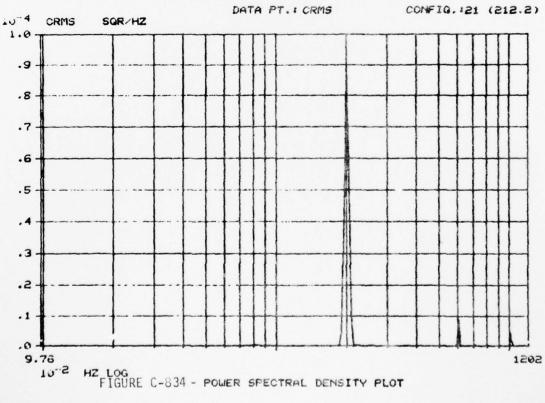
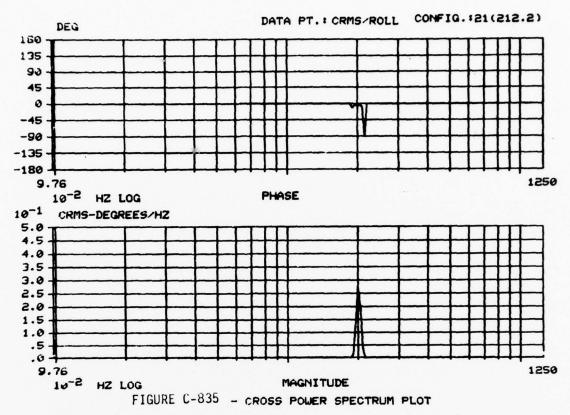


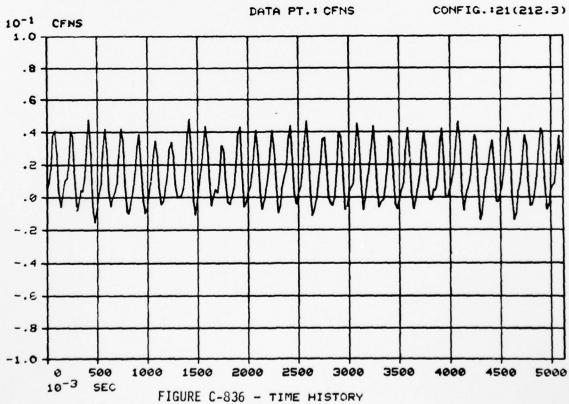
FIGURE C-831 - CROSS POWER SPECTRUM PLOT

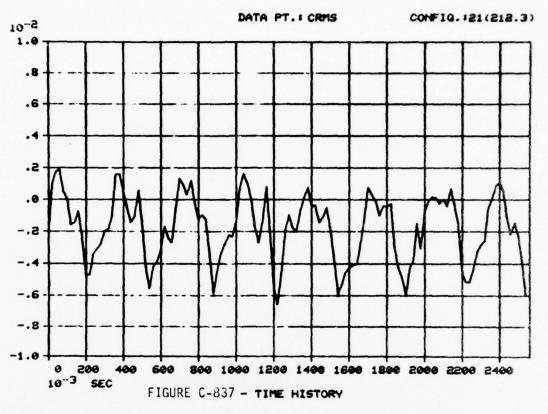


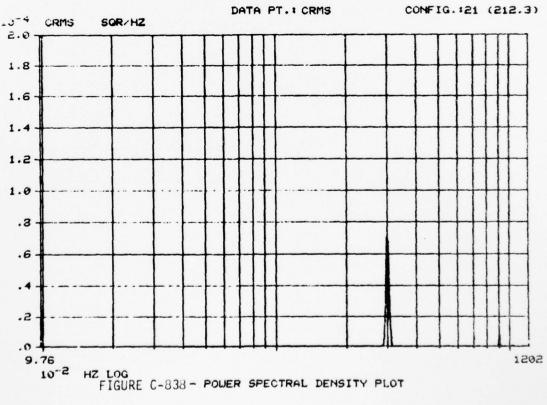


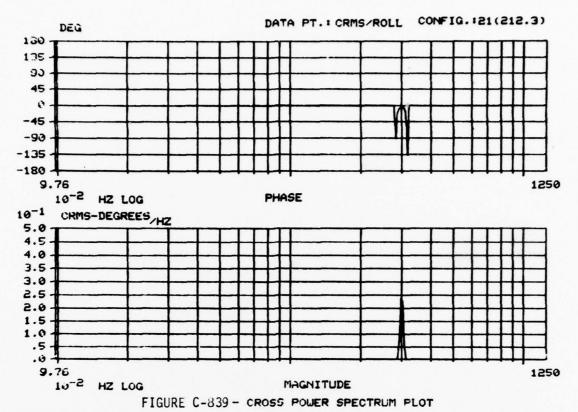


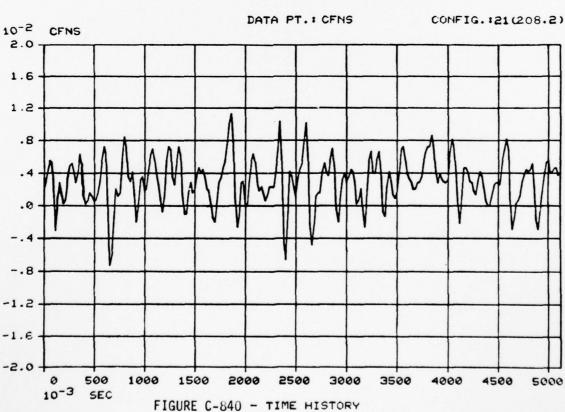


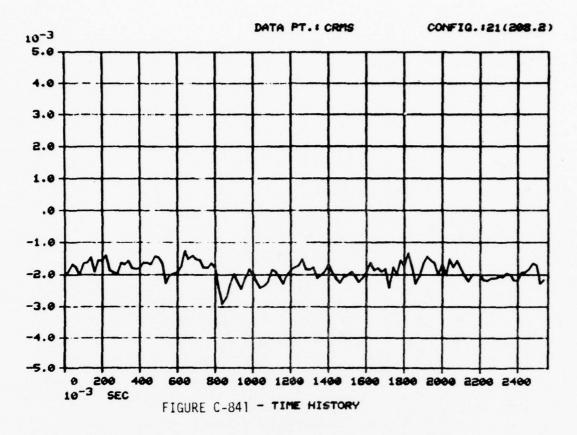


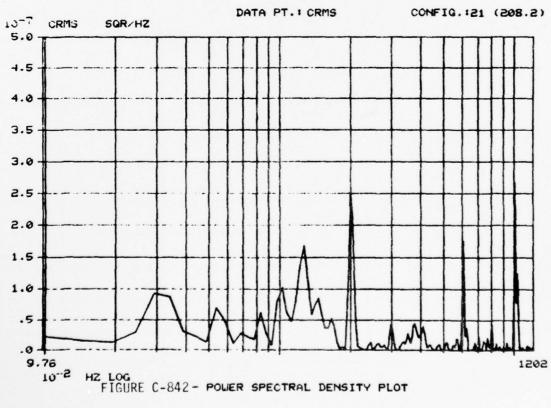


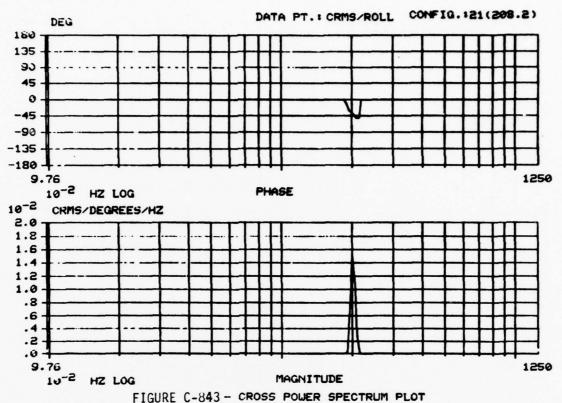


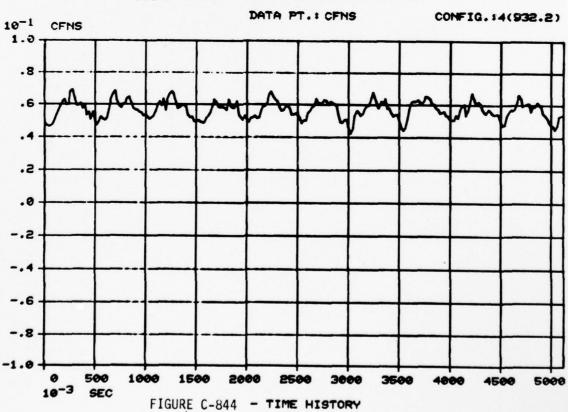


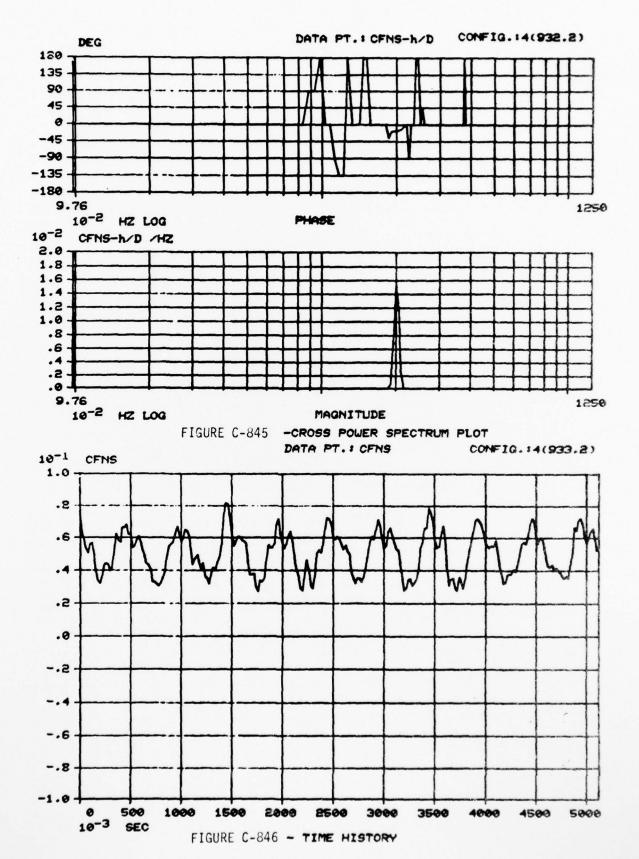


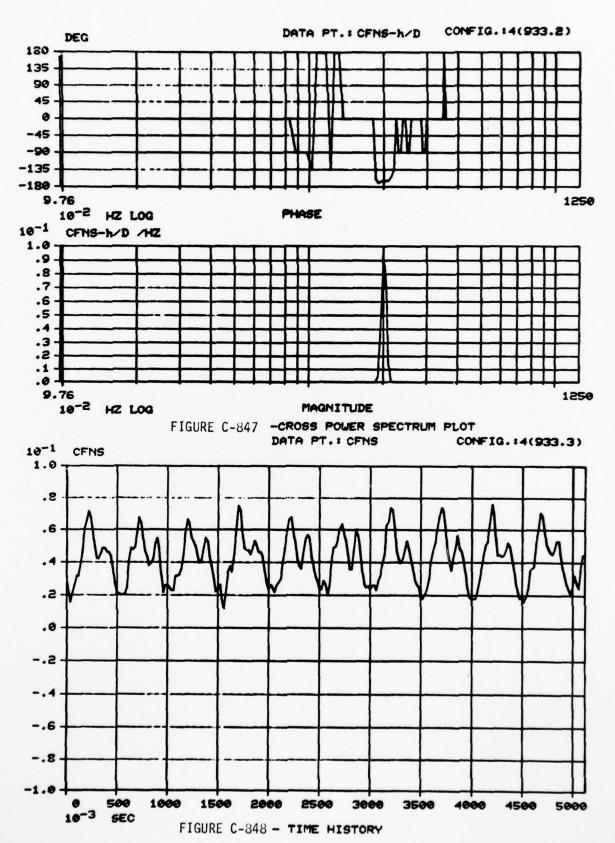


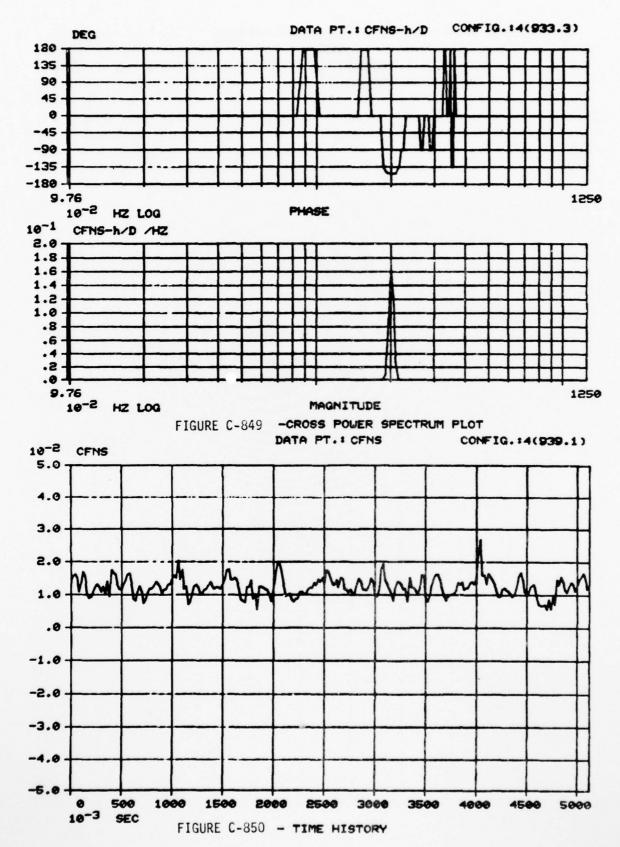


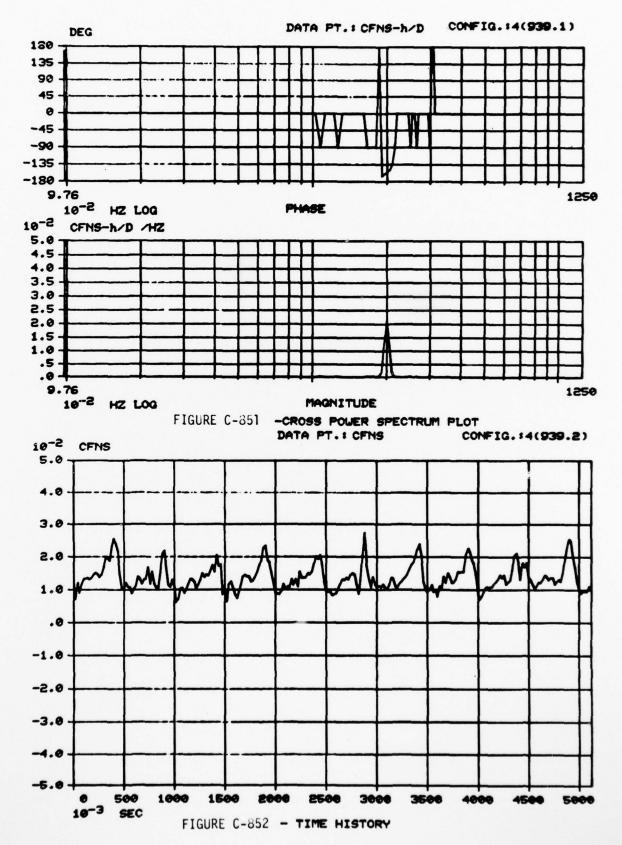


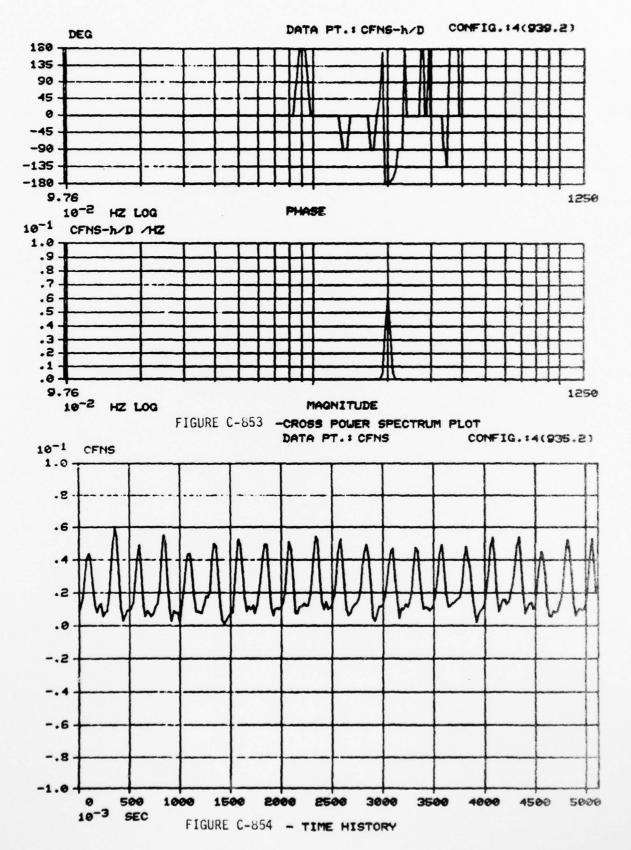


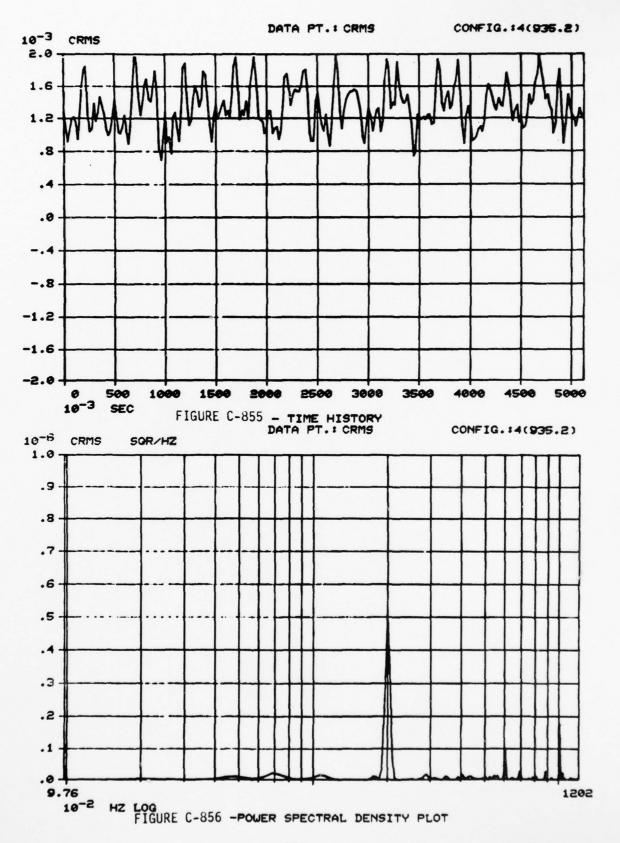


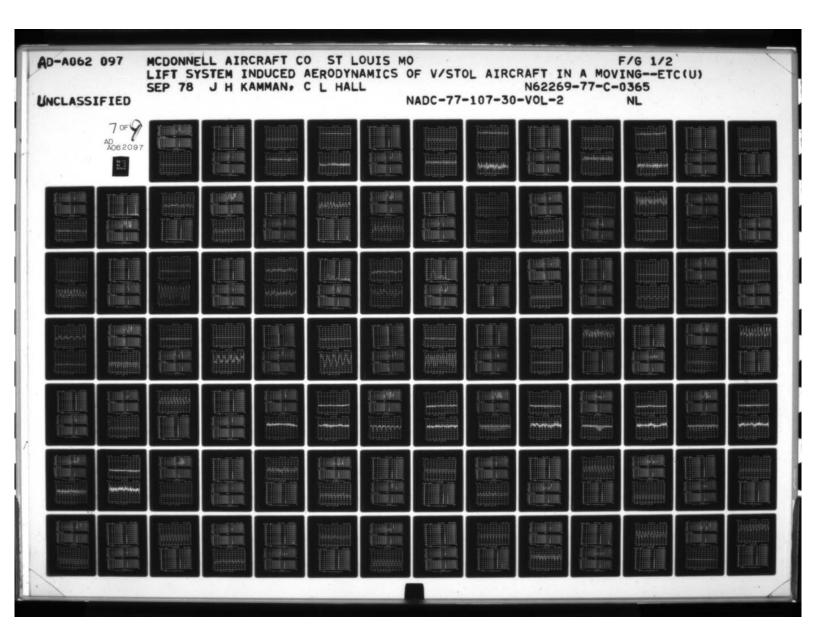


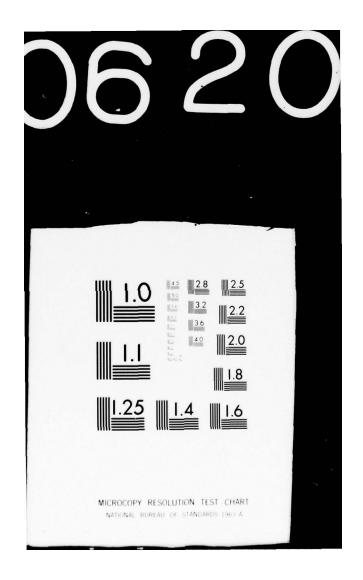


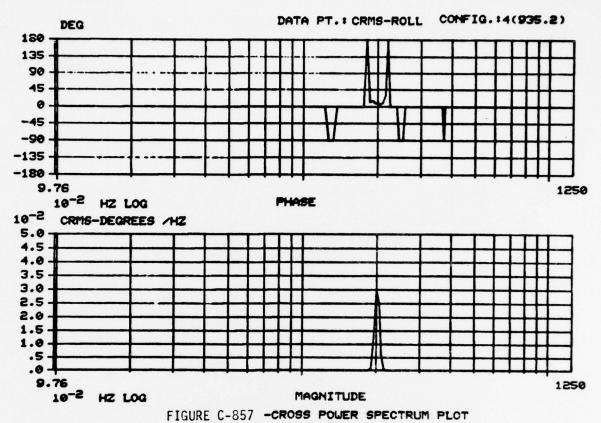


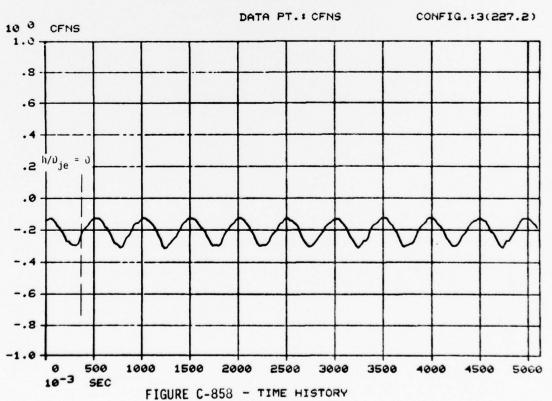


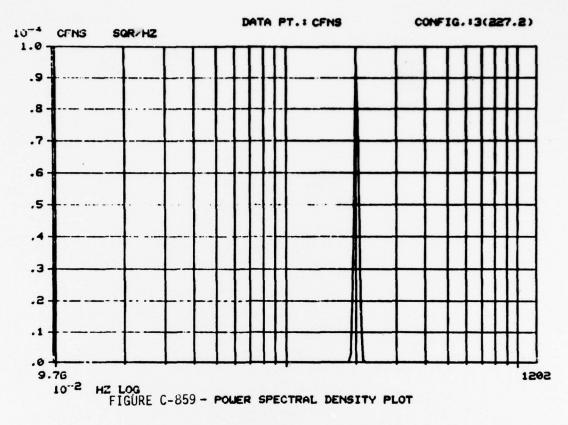












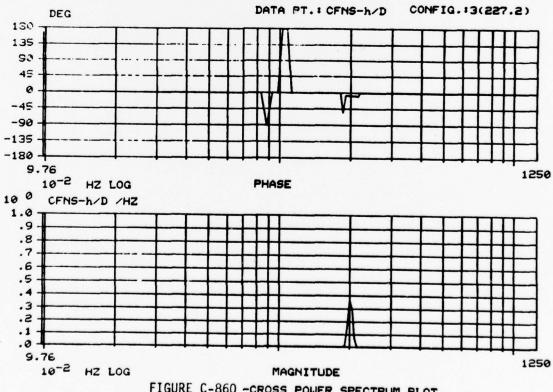
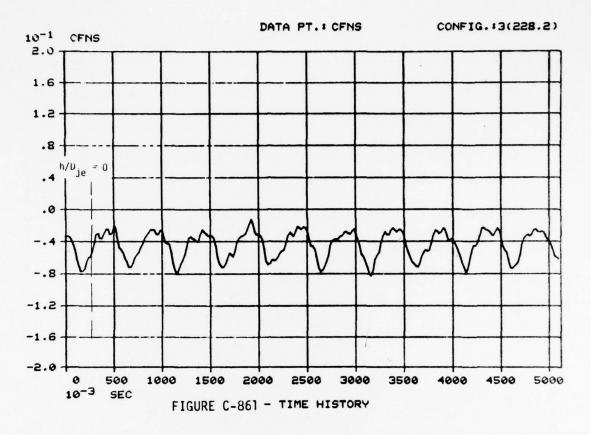
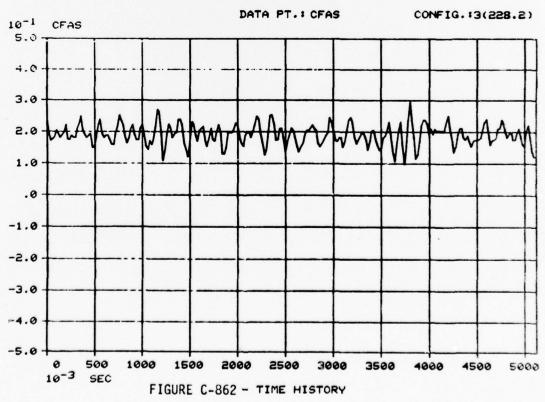
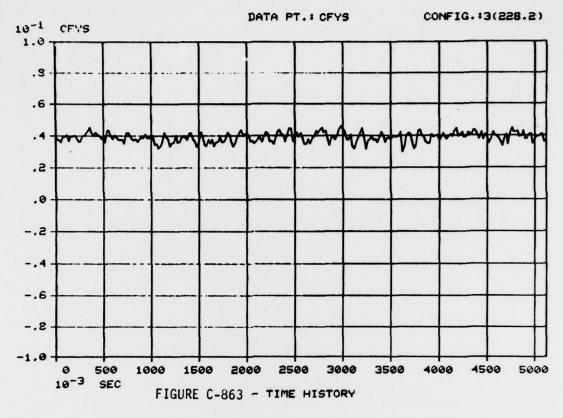
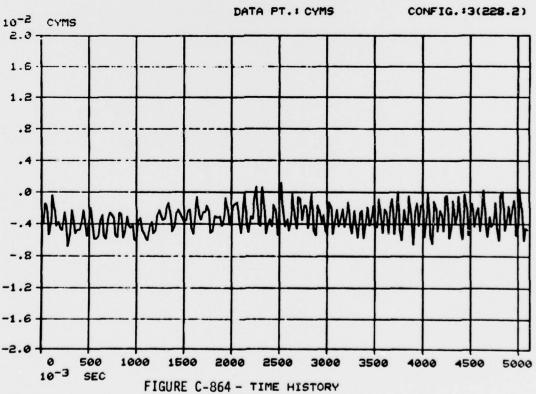


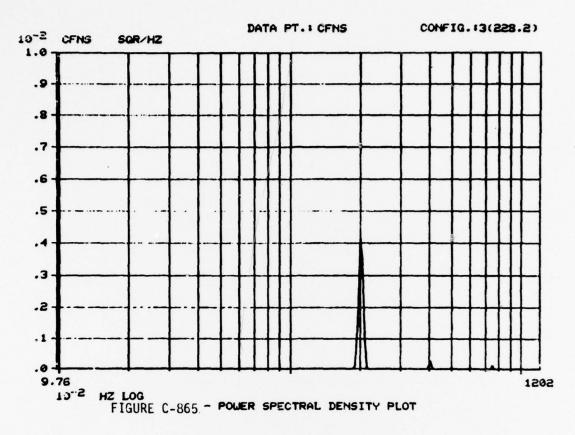
FIGURE C-860 -CROSS POWER SPECTRUM PLOT











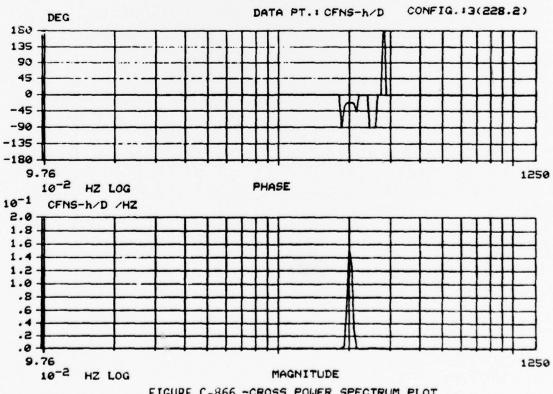
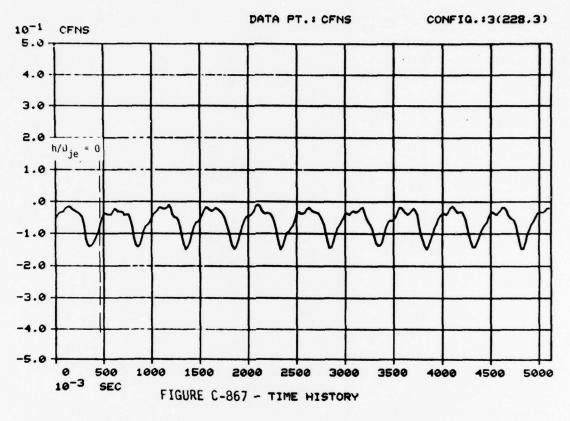
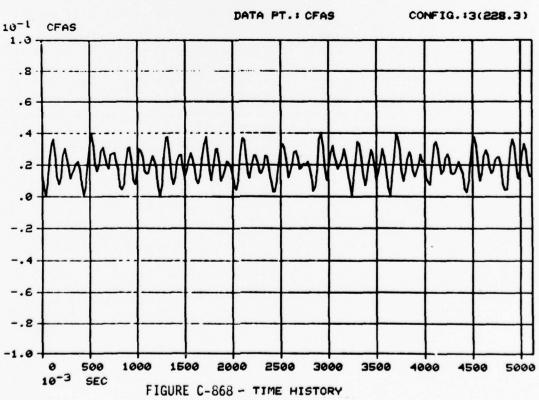
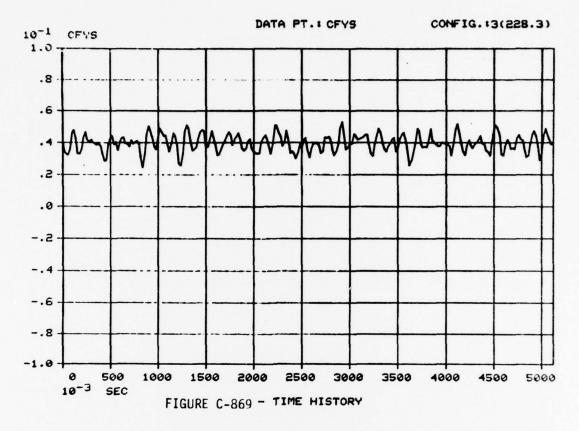
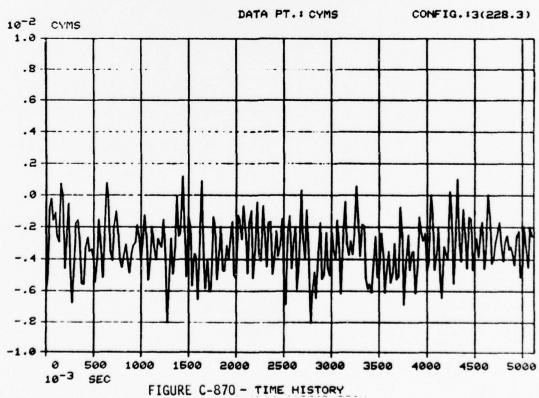


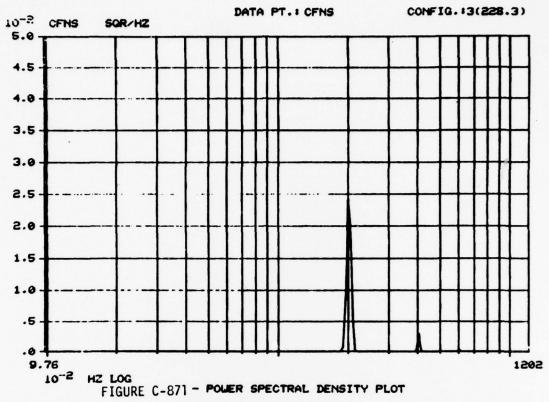
FIGURE C-866 -CROSS POWER SPECTRUM PLOT

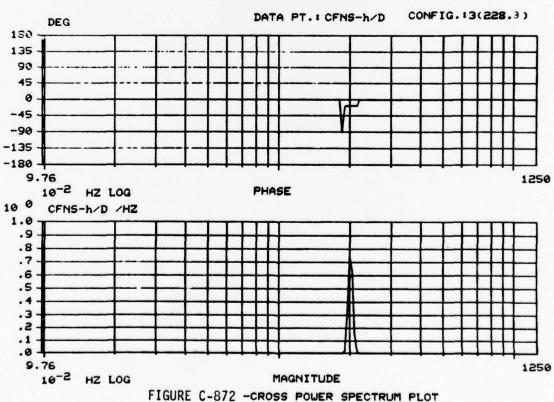


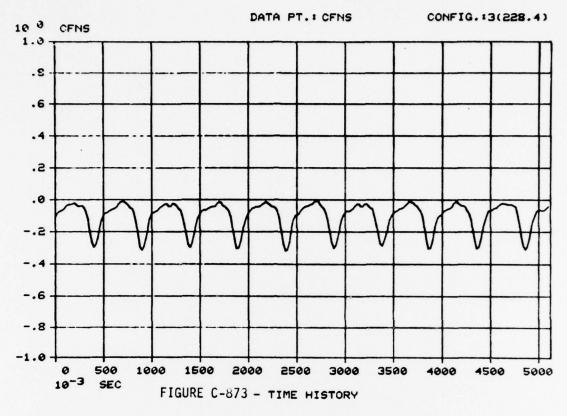


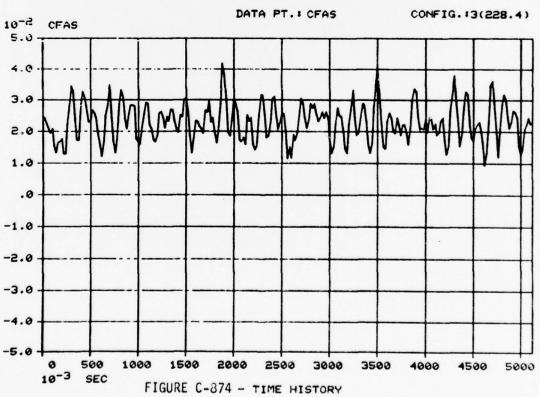


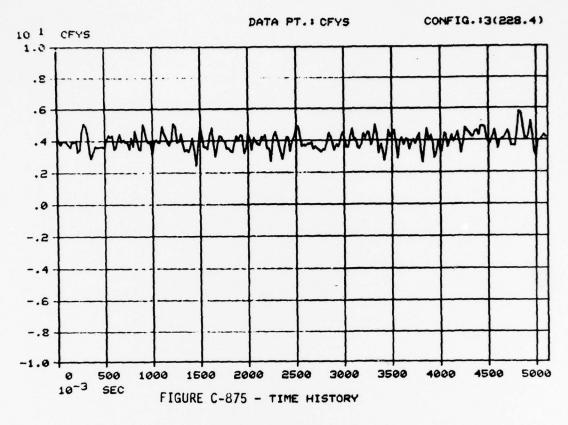


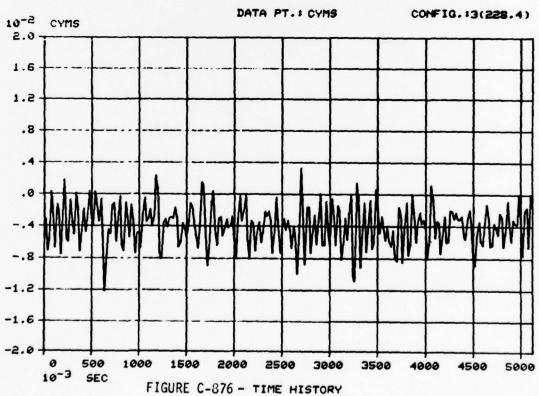


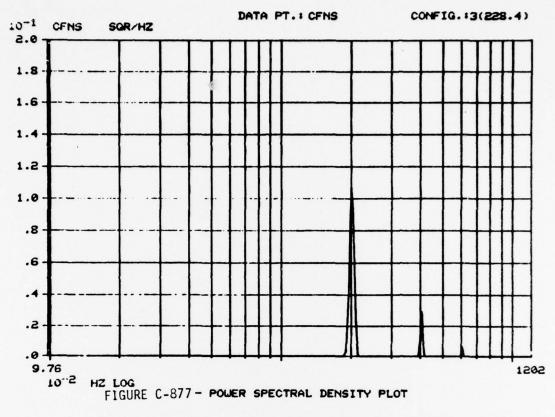












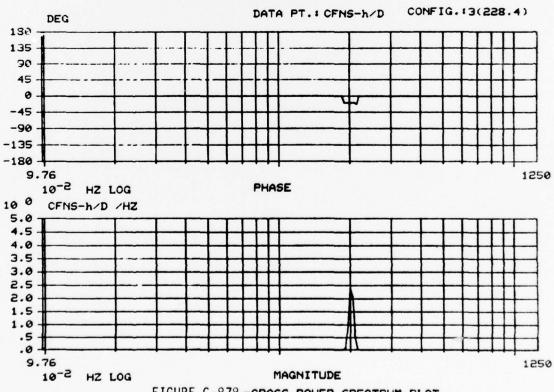
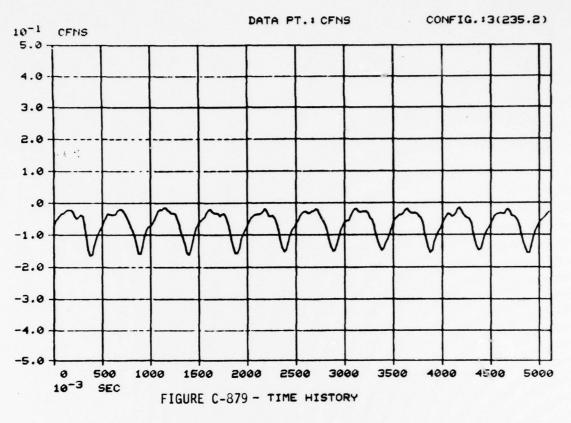
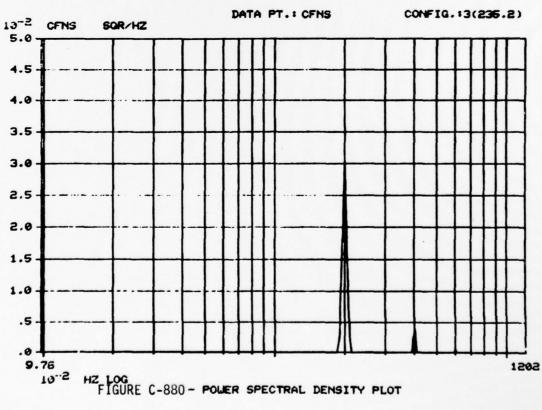
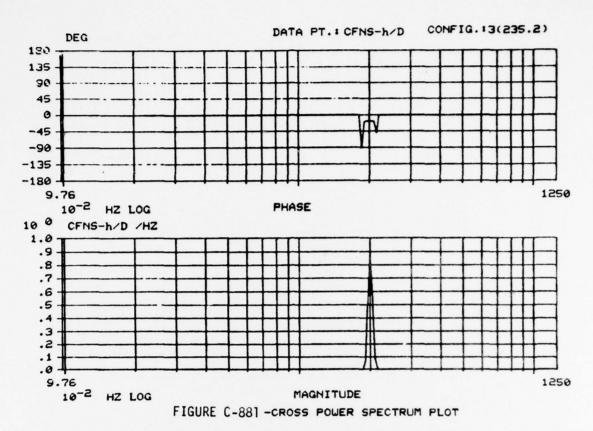
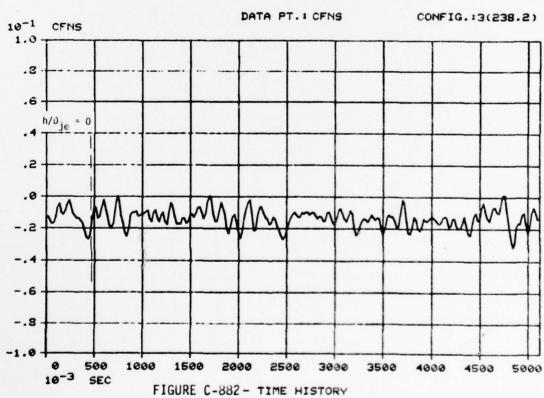


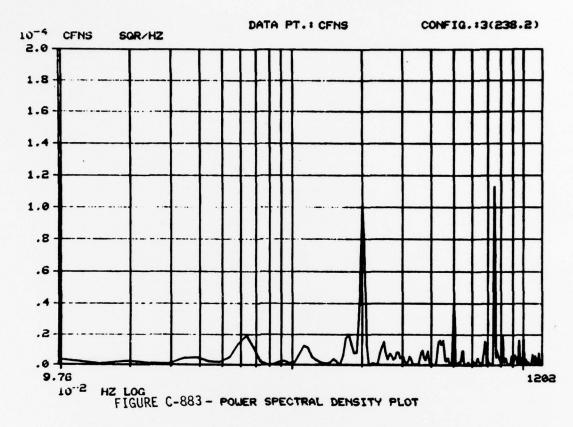
FIGURE C-878 -CROSS POWER SPECTRUM PLOT

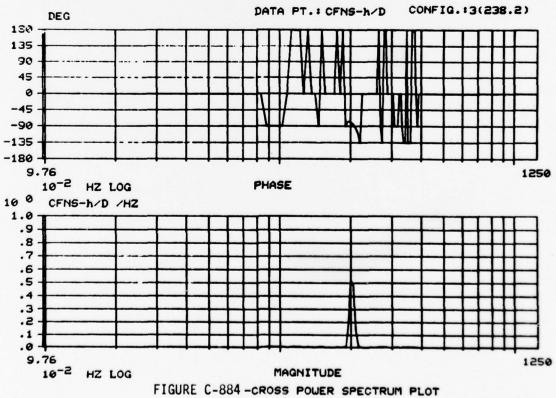


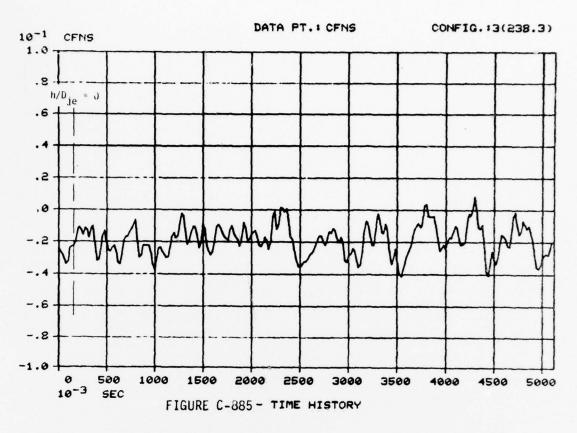


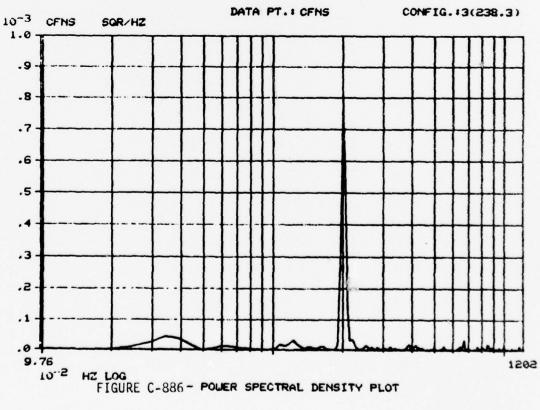


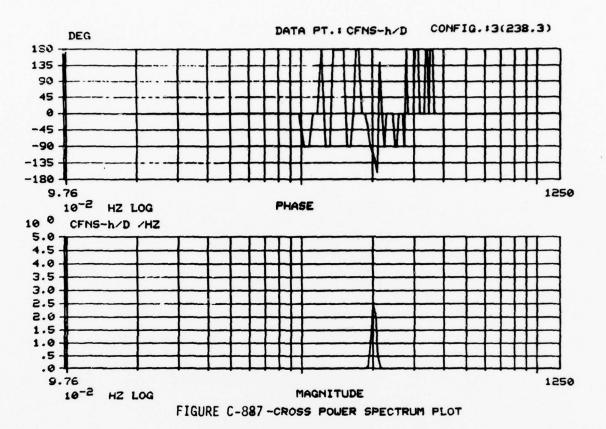


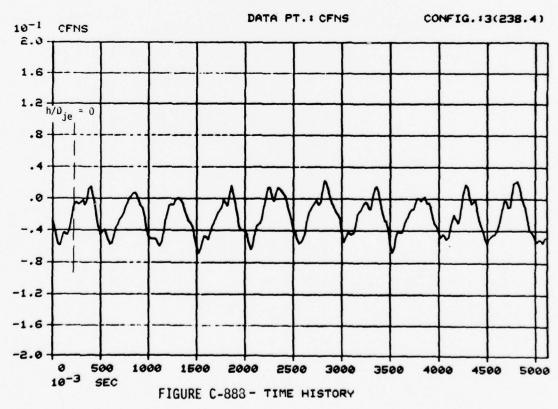


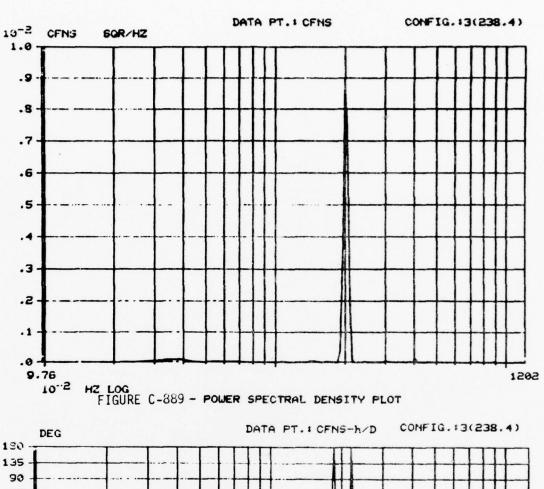












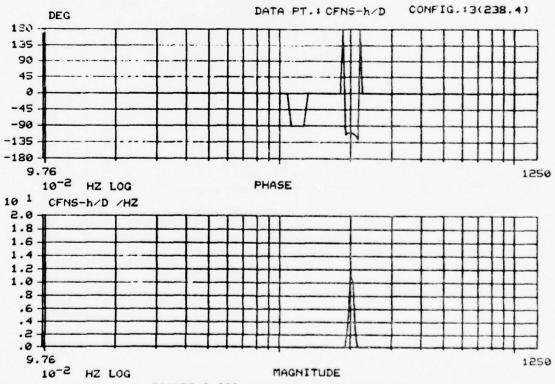
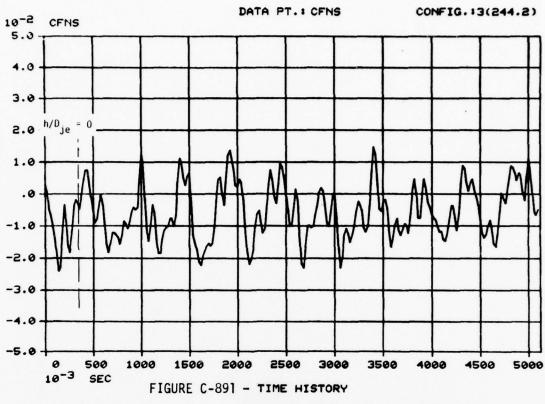
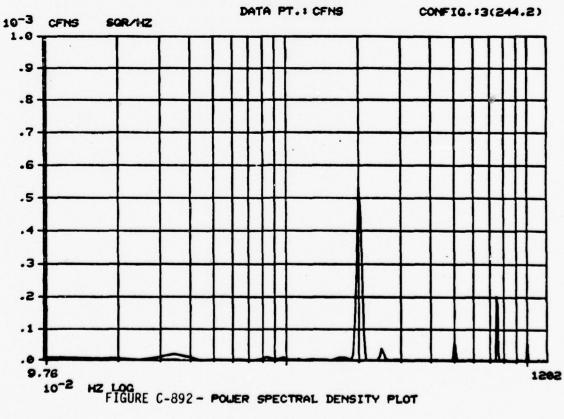
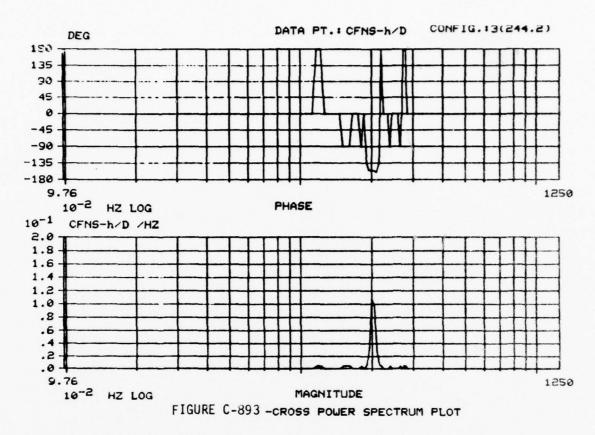
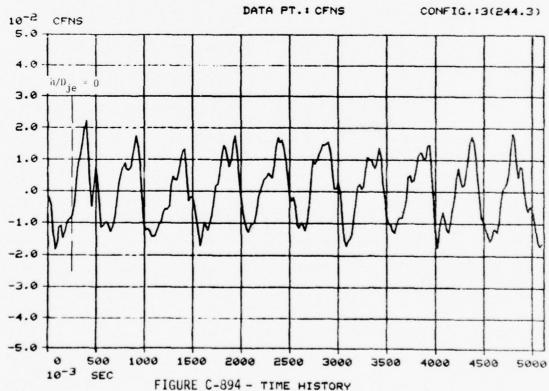


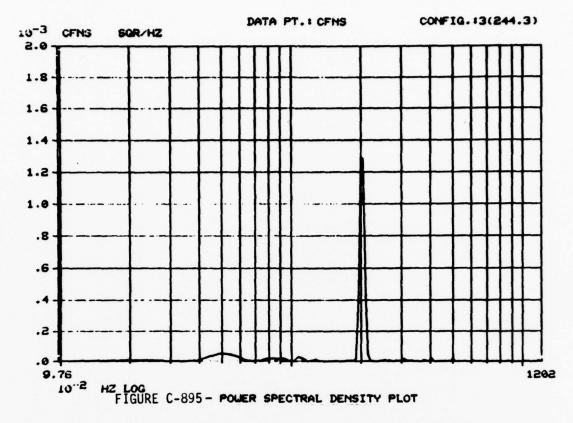
FIGURE C-890 -cross POWER SPECTRUM PLOT

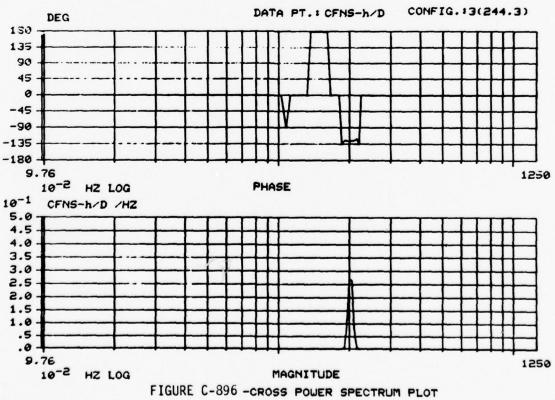


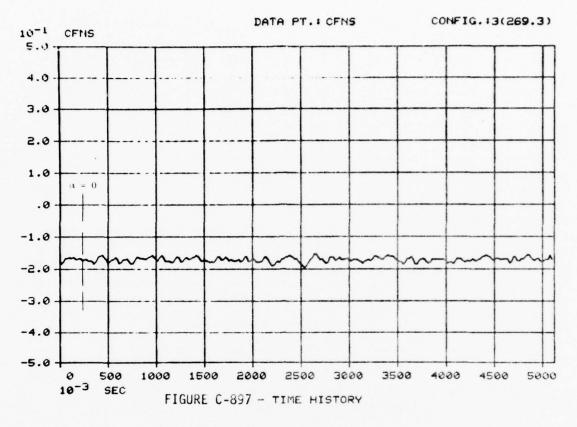


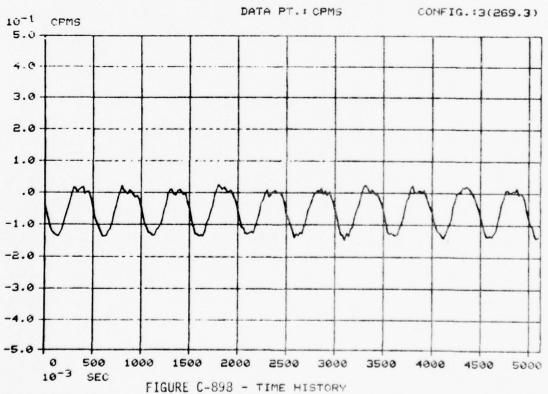


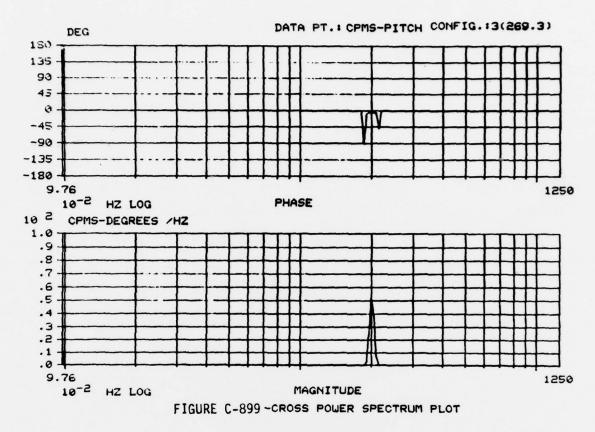


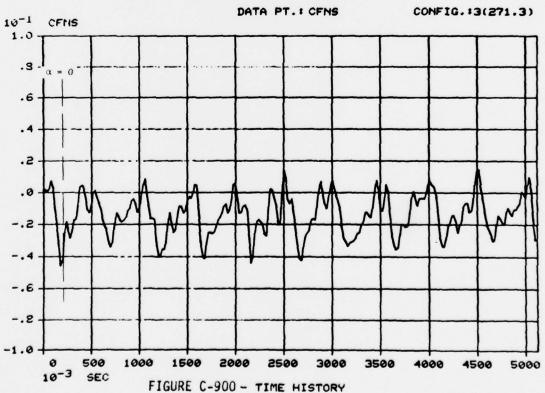


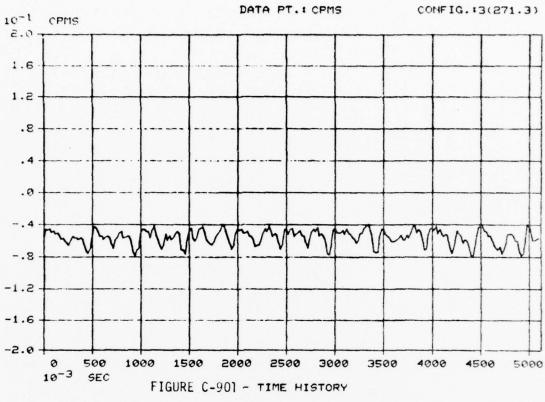


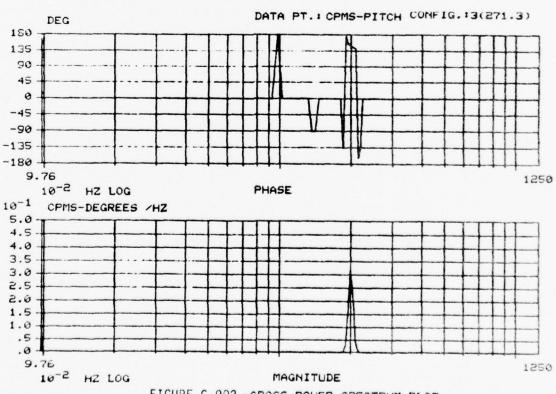


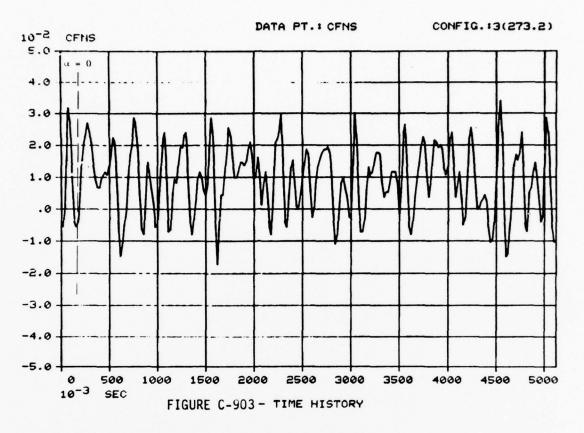


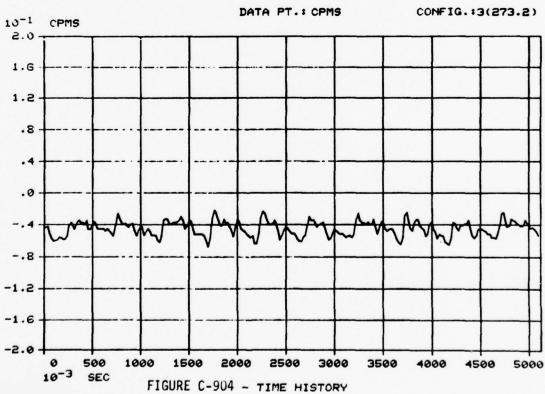


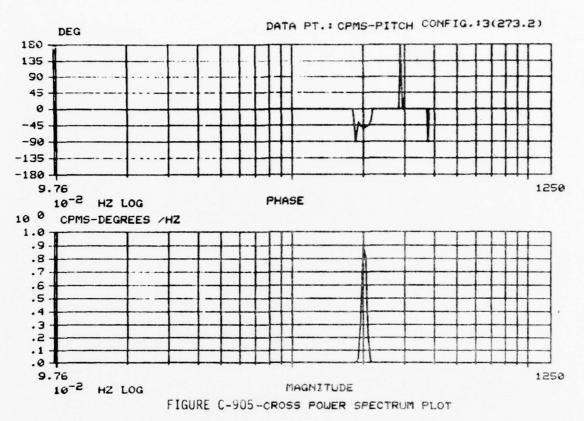


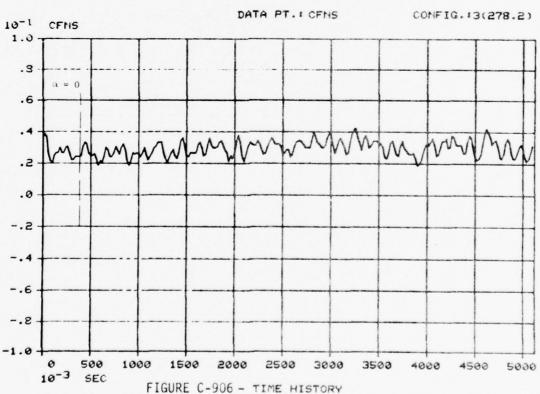


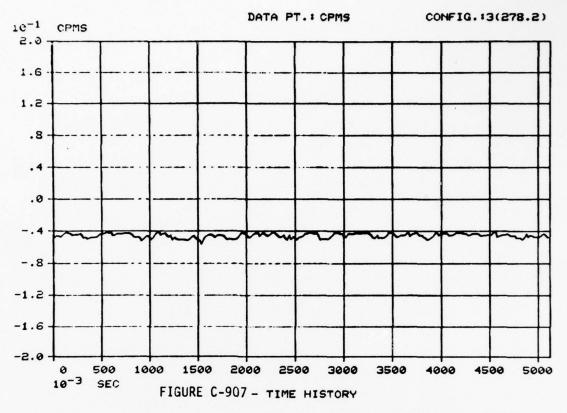












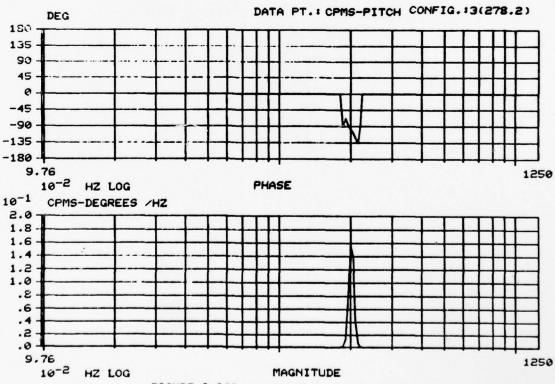
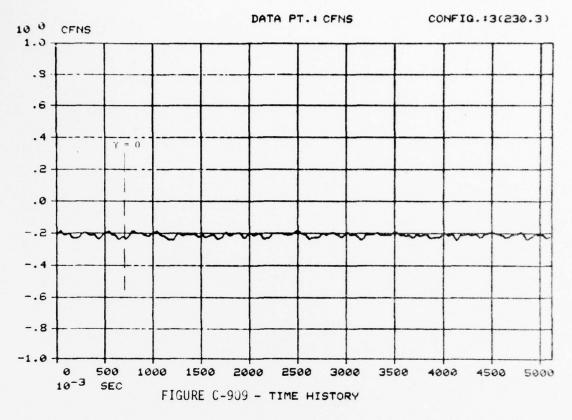
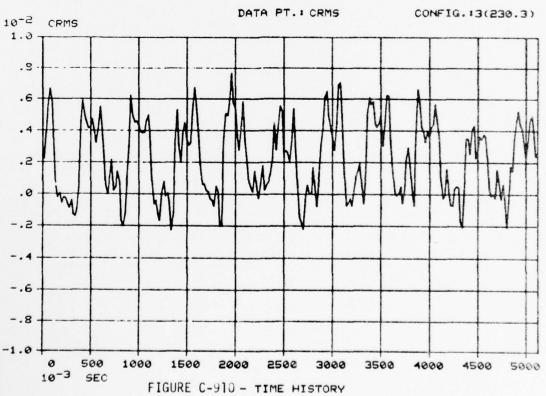
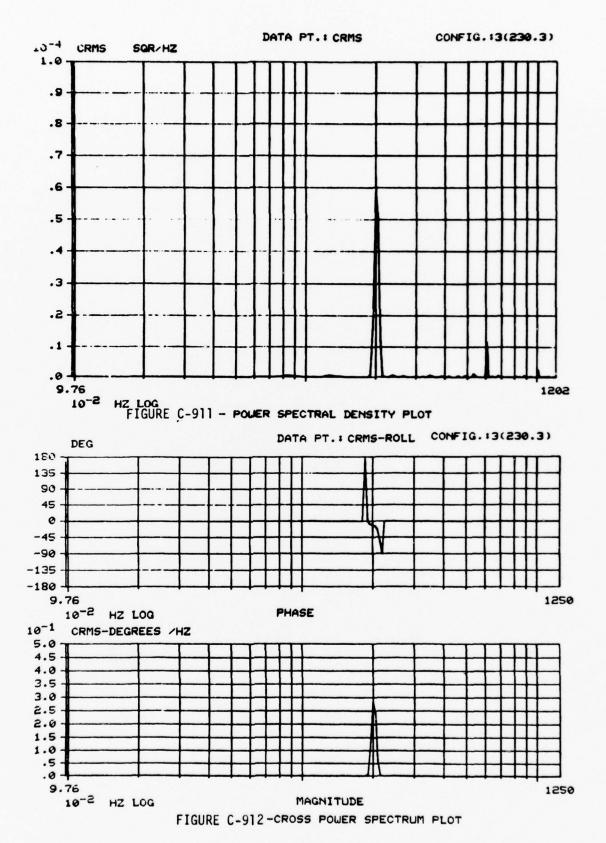
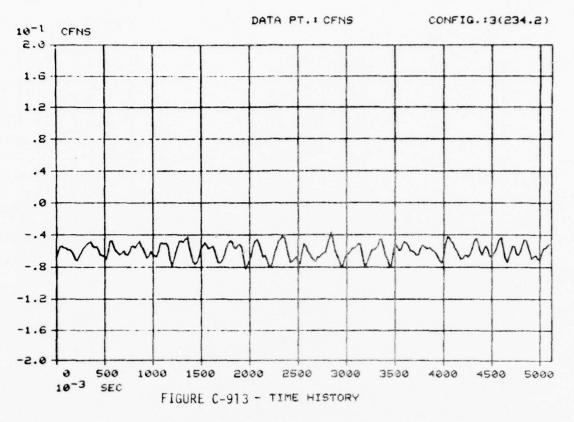


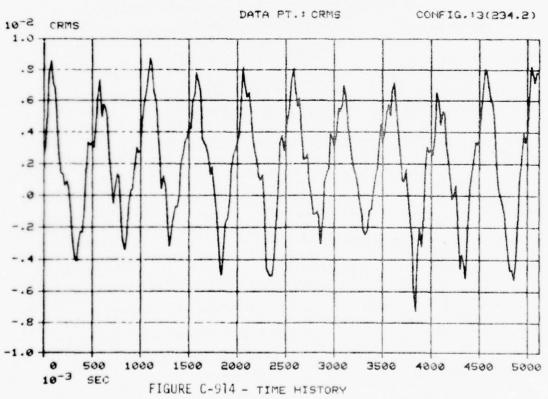
FIGURE C-908 -cross power spectrum PLOT

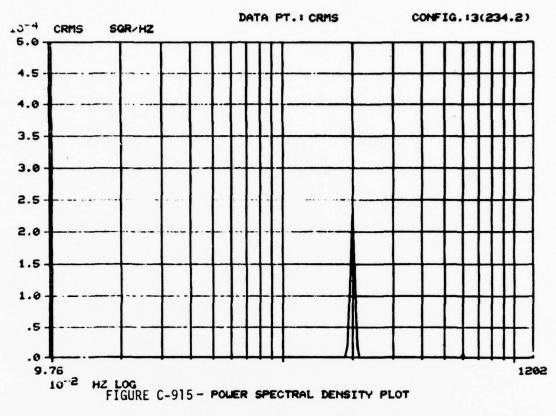












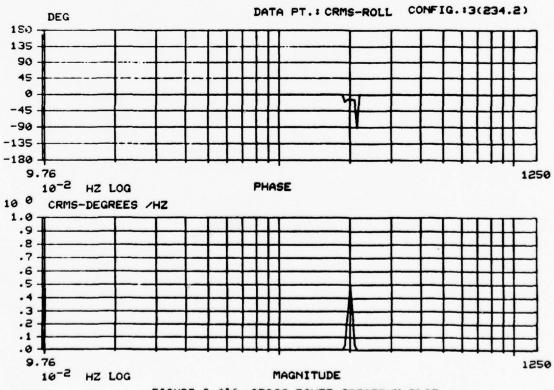
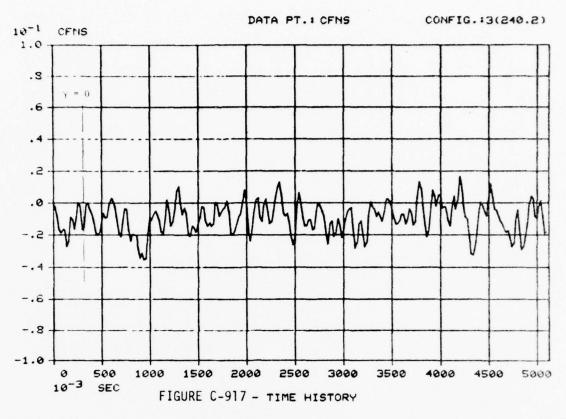
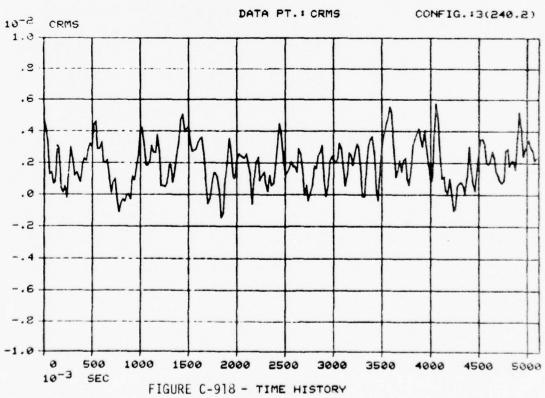
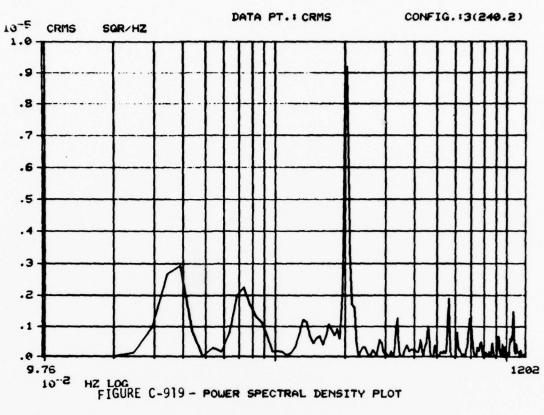
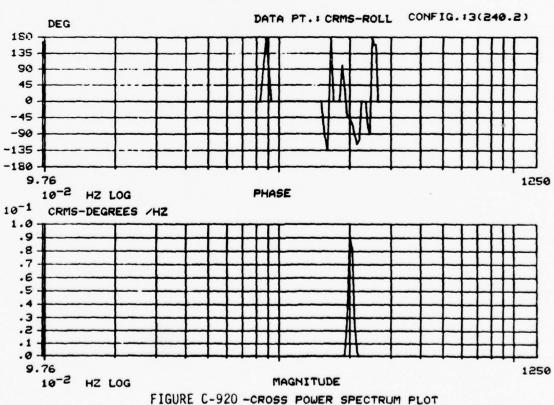


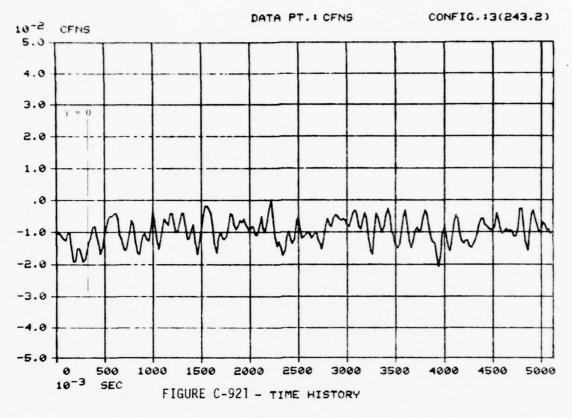
FIGURE C-916 -CROSS POWER SPECTRUM PLOT

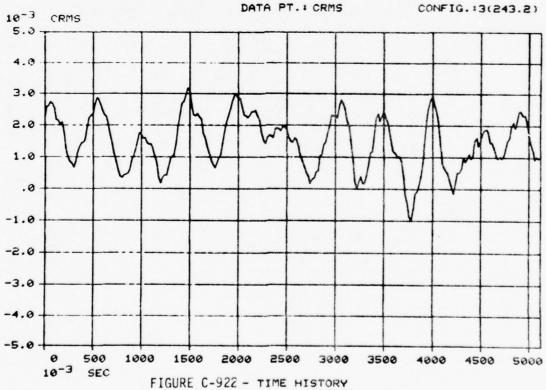


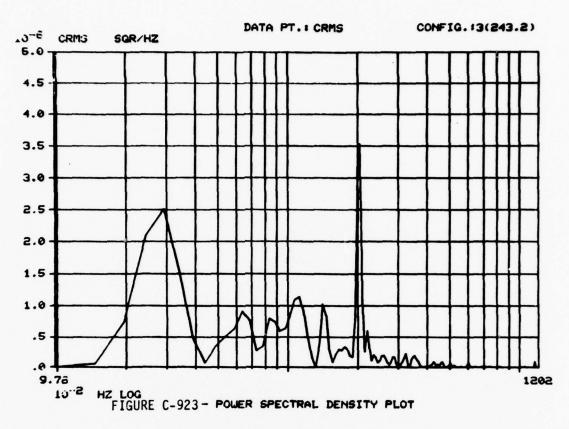


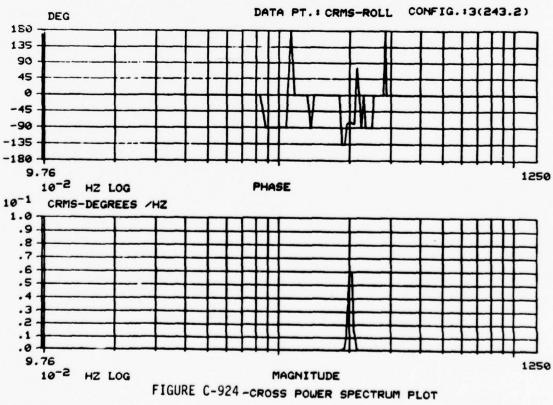


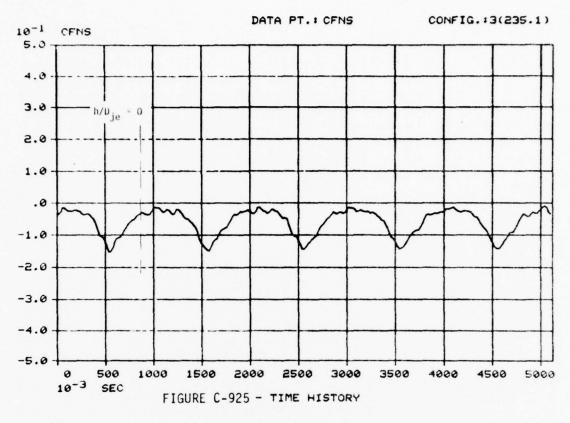


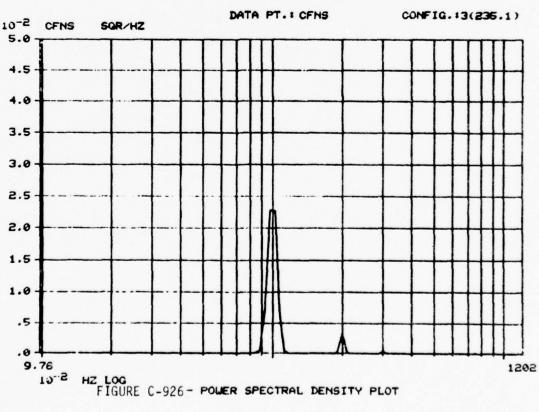


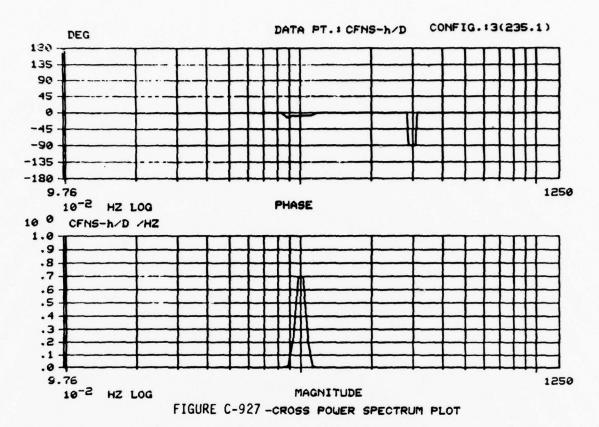




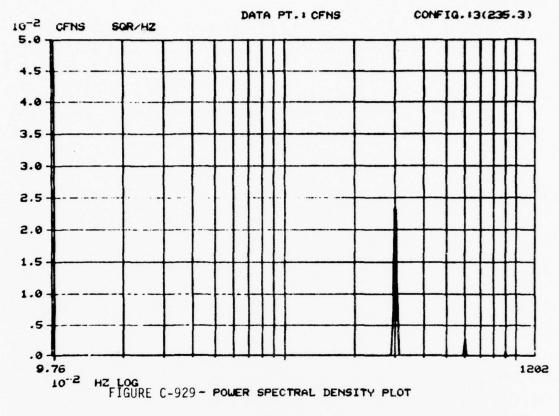


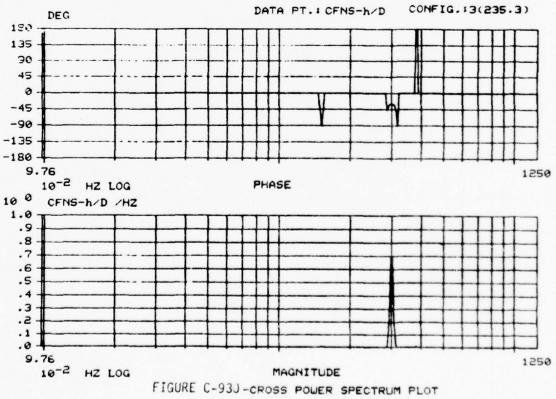


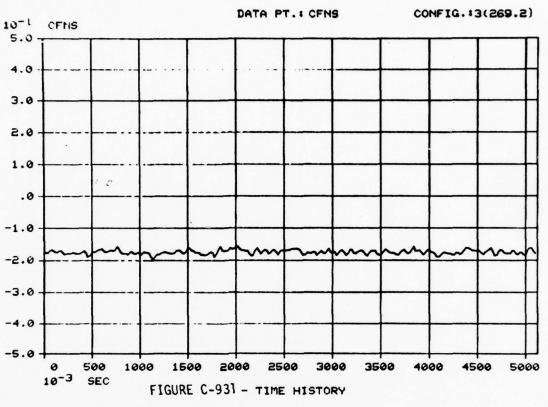


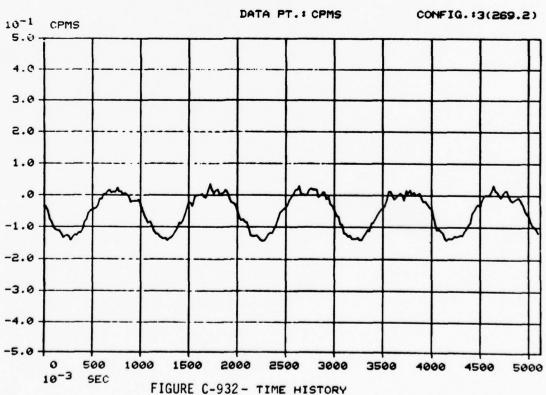


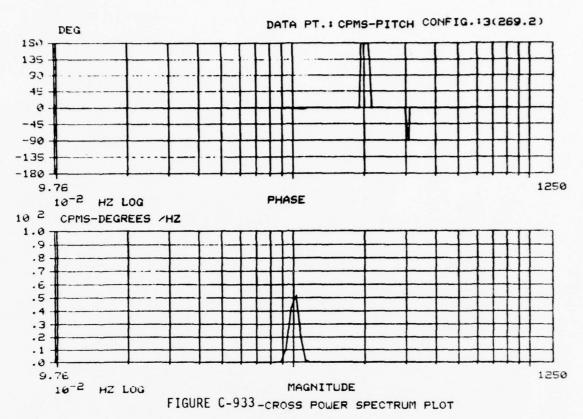
DATA PT.: CFNS CONFIG. 13(235.3) 10-1 CFNS 5.0 -4.0 3.0 2.0 h/D<sub>je</sub> = 1.0 .0 -1.0 -2.0 -3.0 -4.0 -5.0 -0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-928 - TIME HISTORY

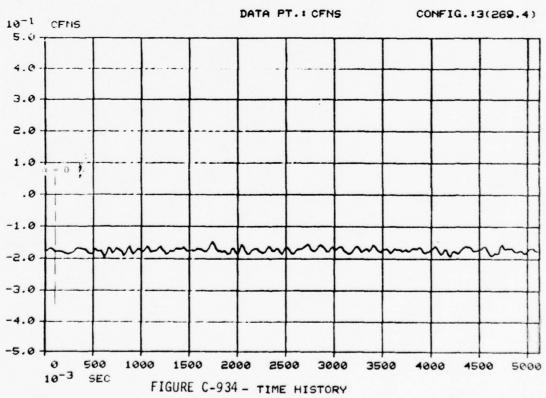


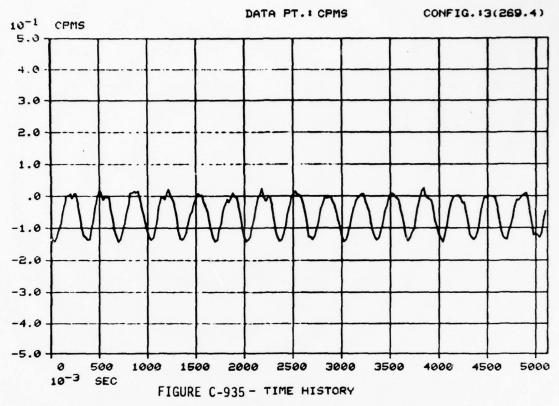


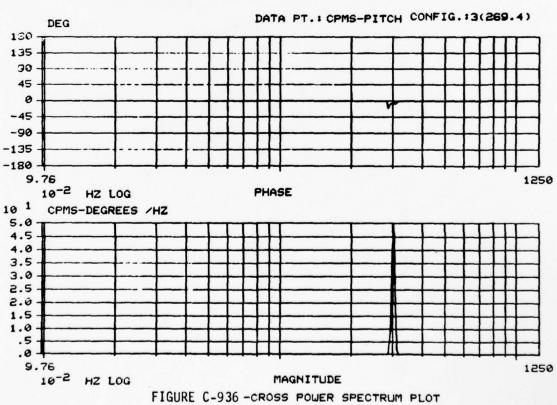


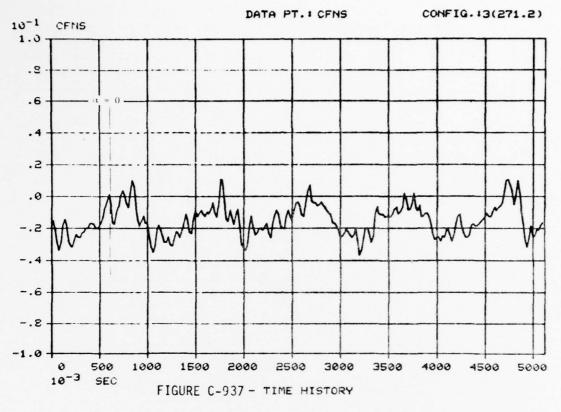


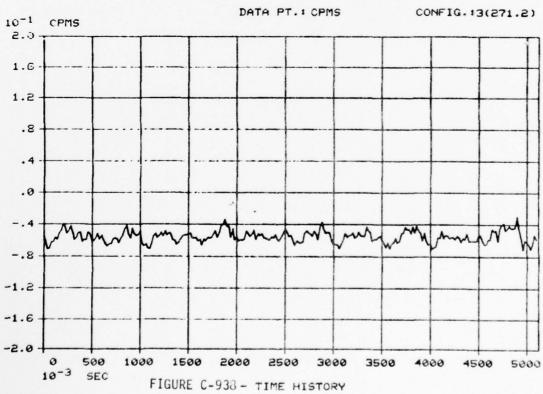


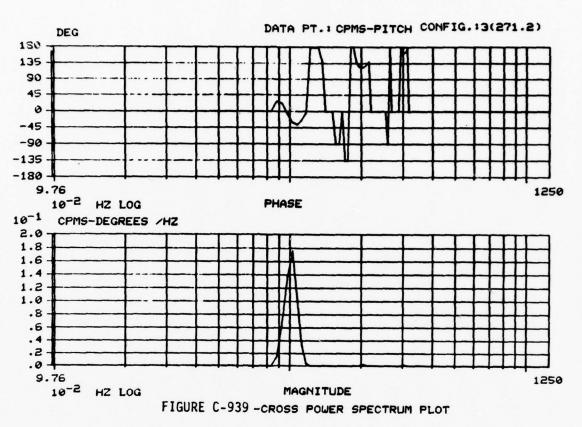


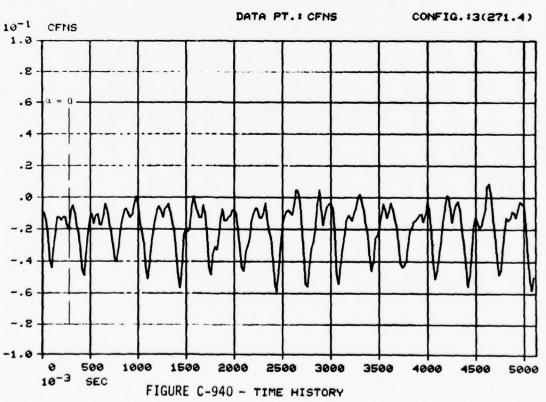


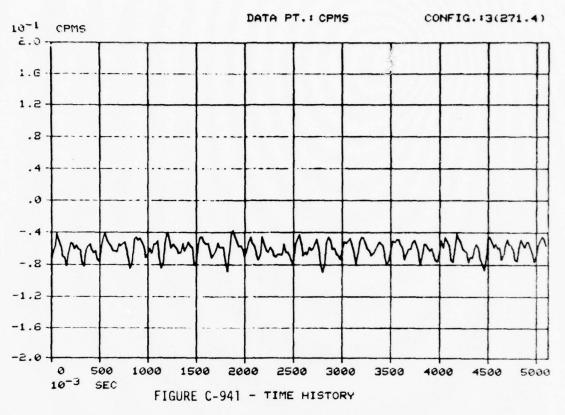


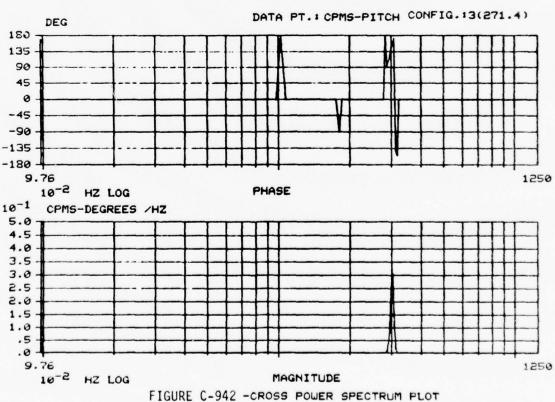


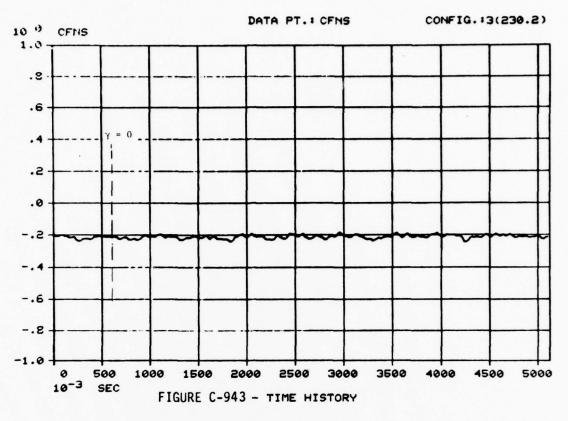


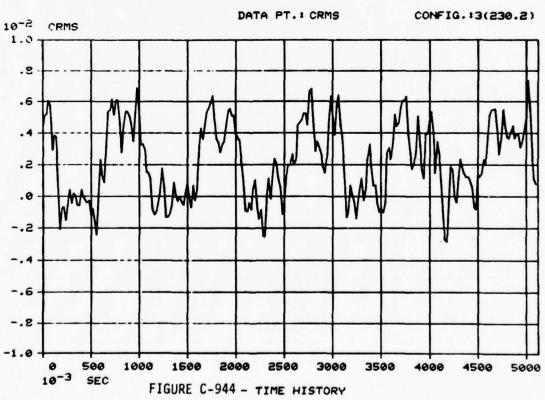


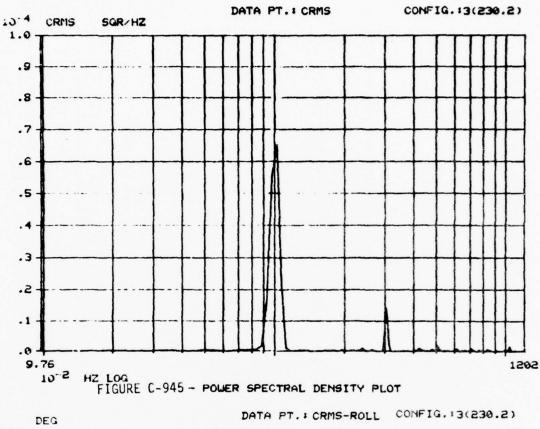












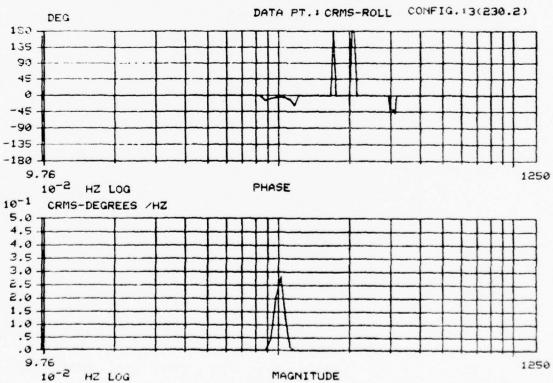
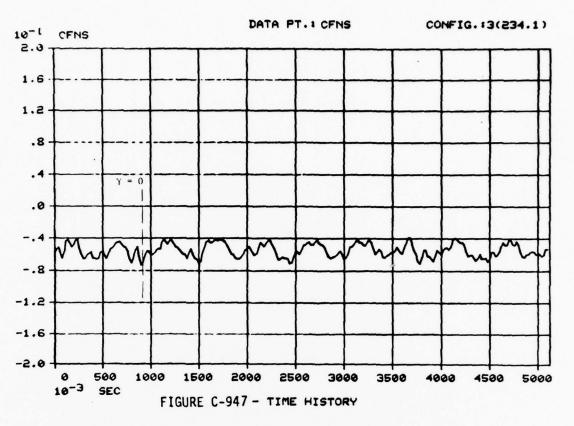
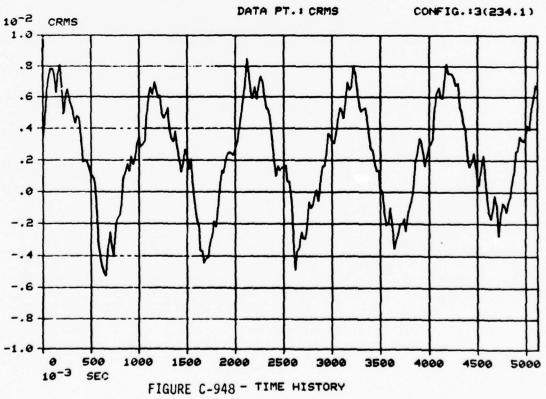
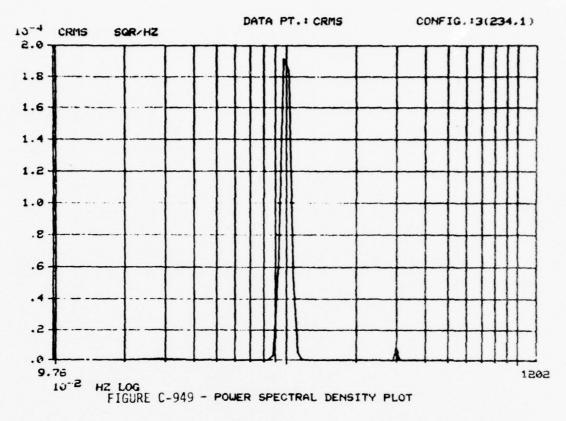
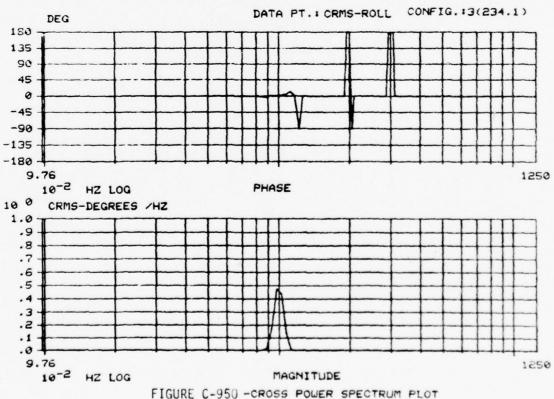


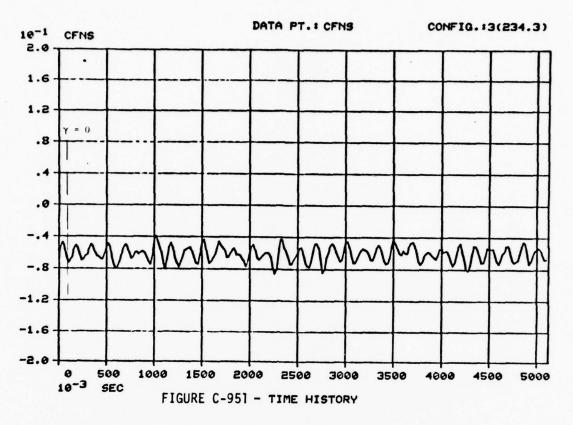
FIGURE C-946 -cross power spectrum PLOT

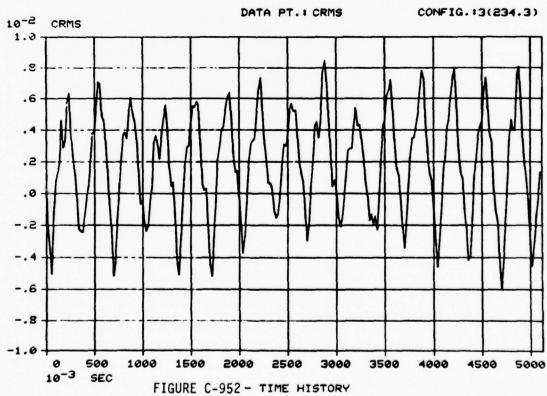


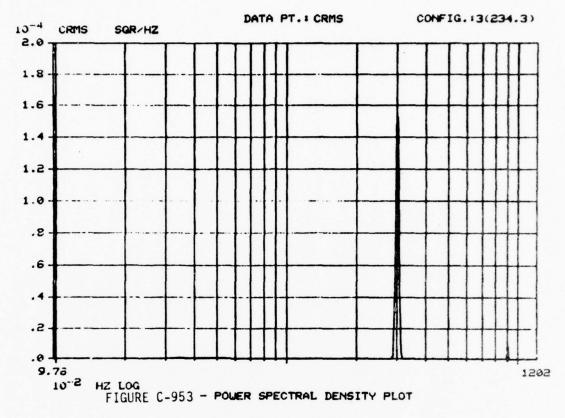


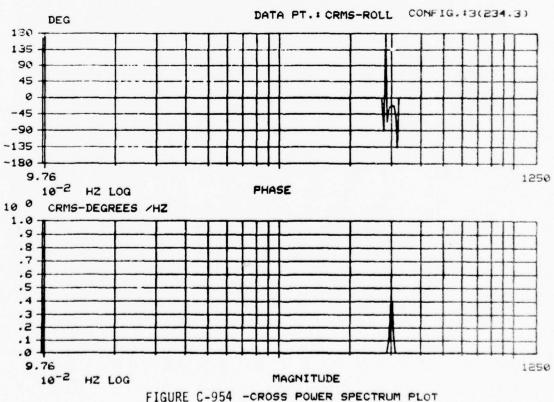


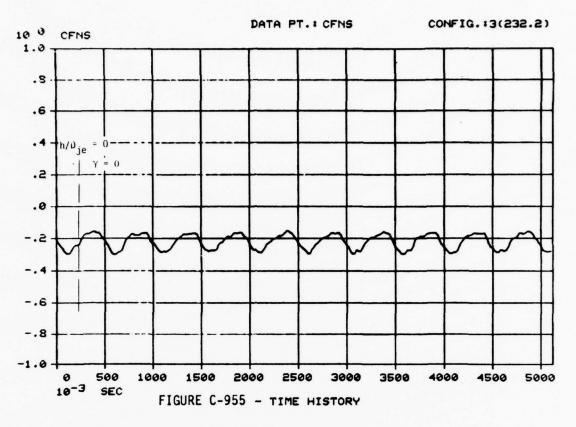


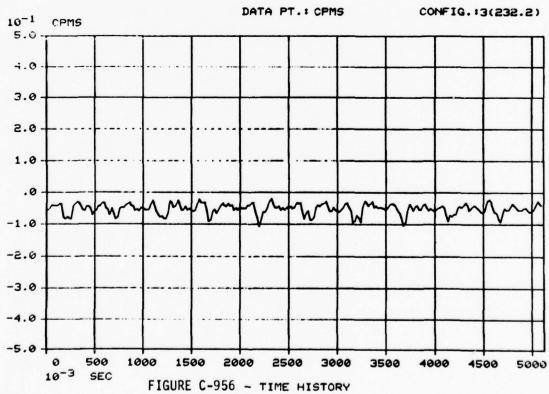


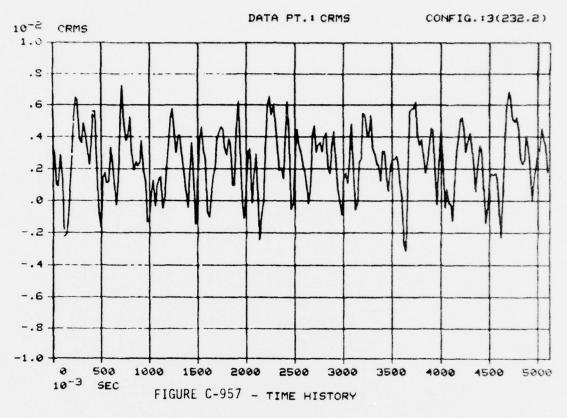


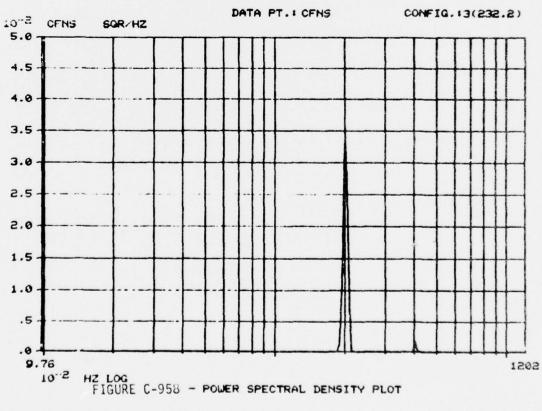


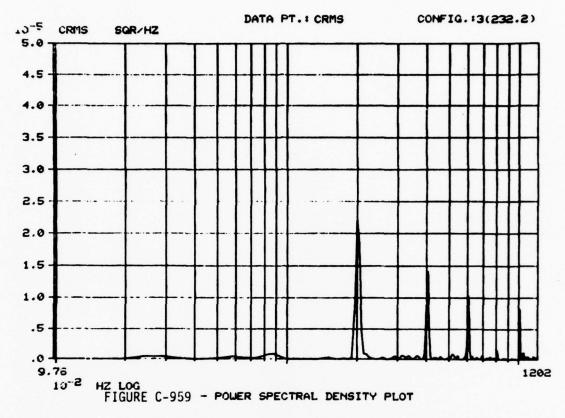


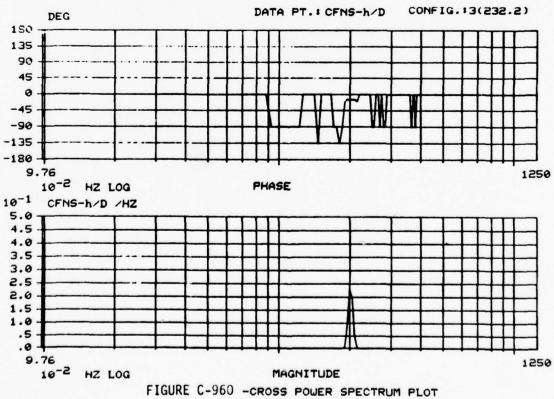


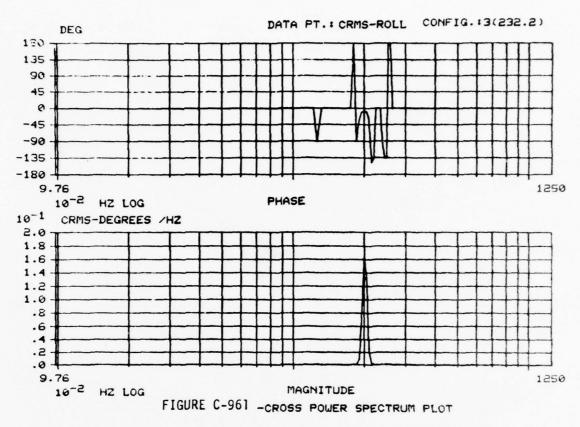


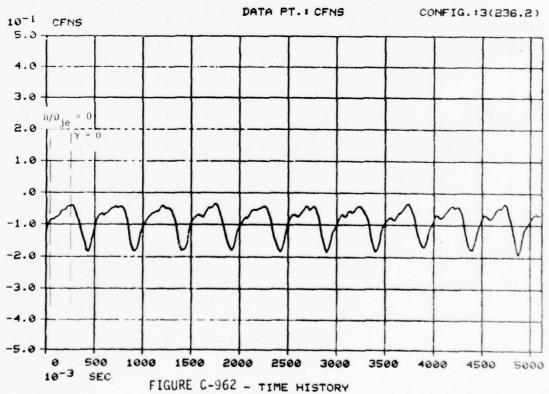


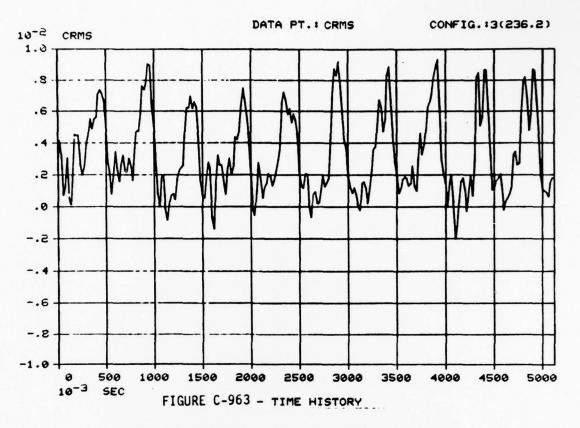


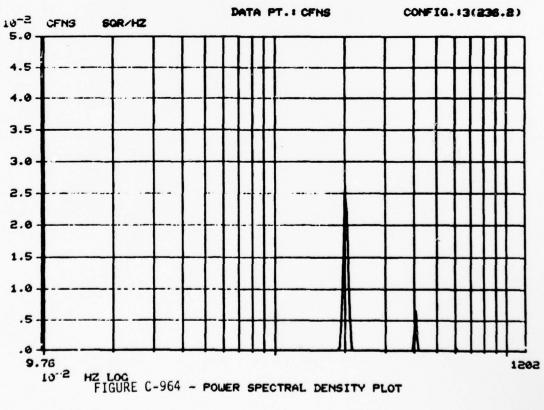


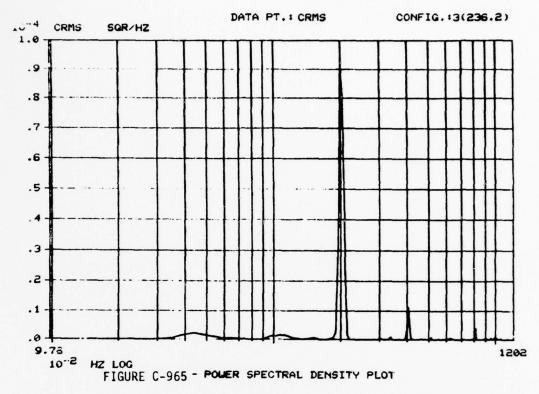












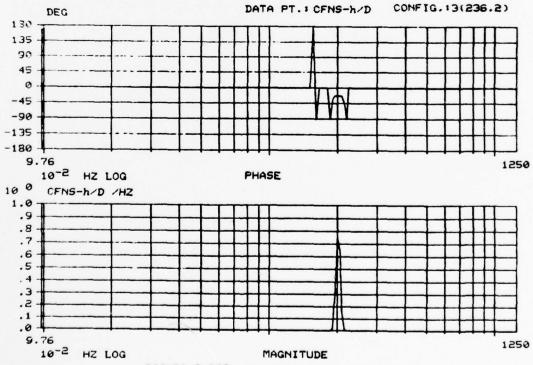
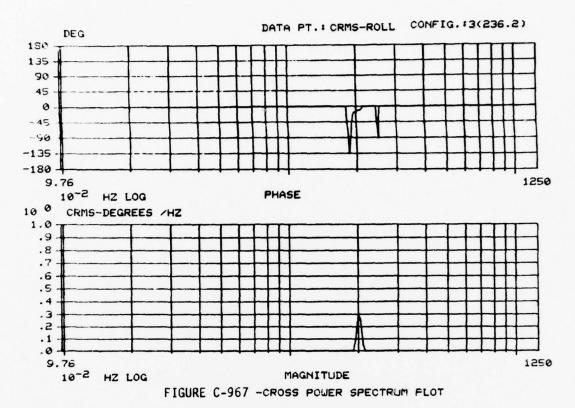
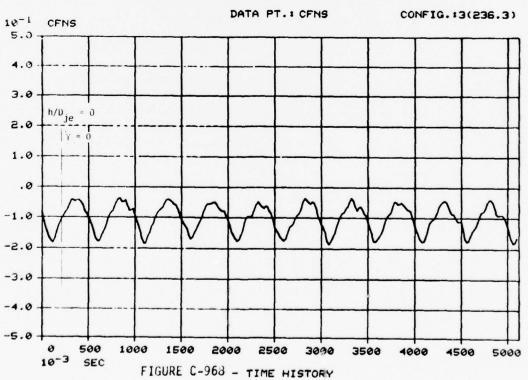
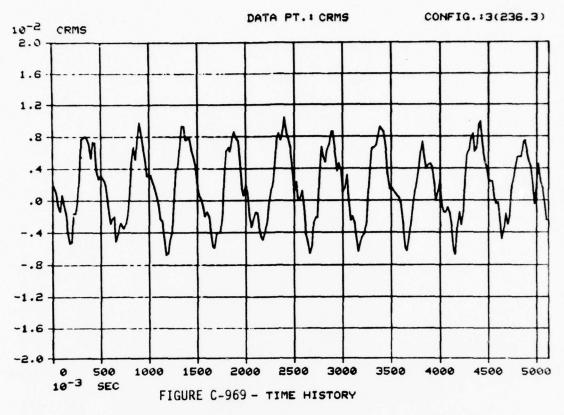
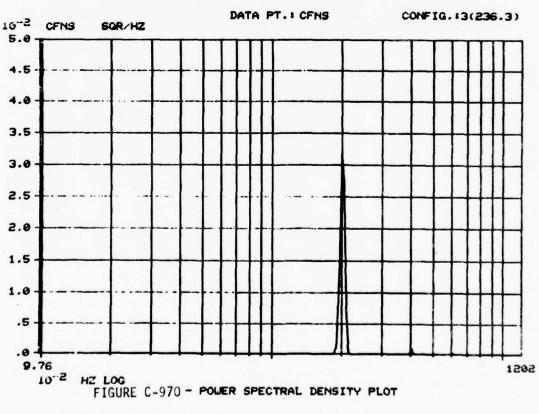


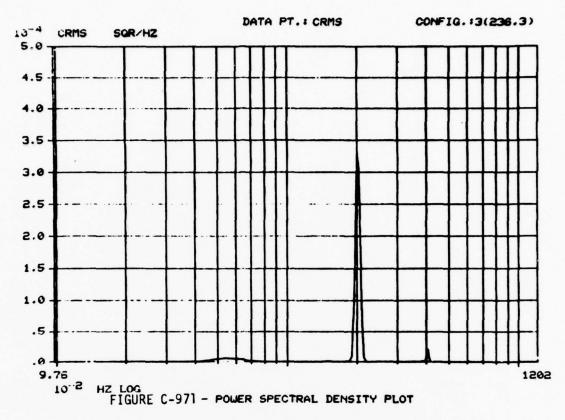
FIGURE C-966 -CROSS POWER SPECTRUM PLOT

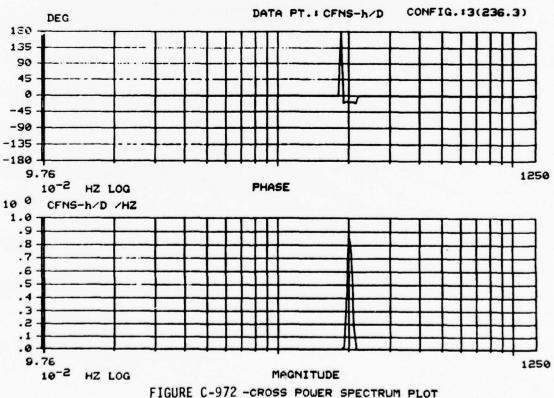


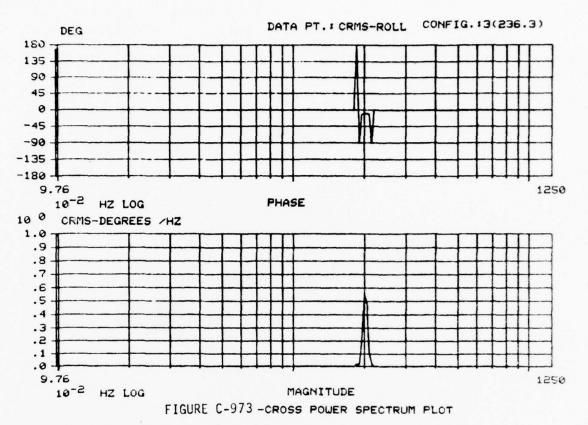


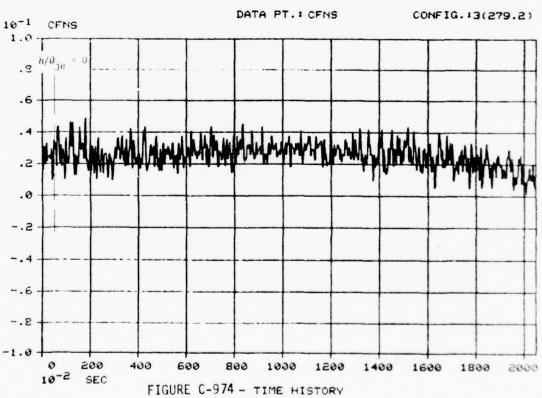


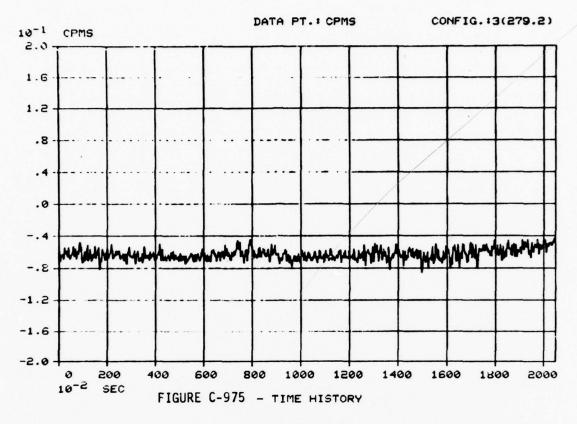


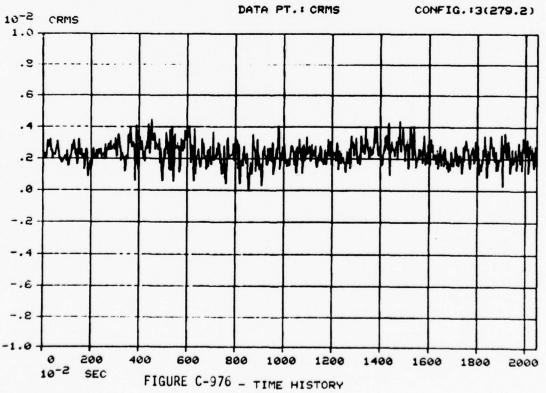


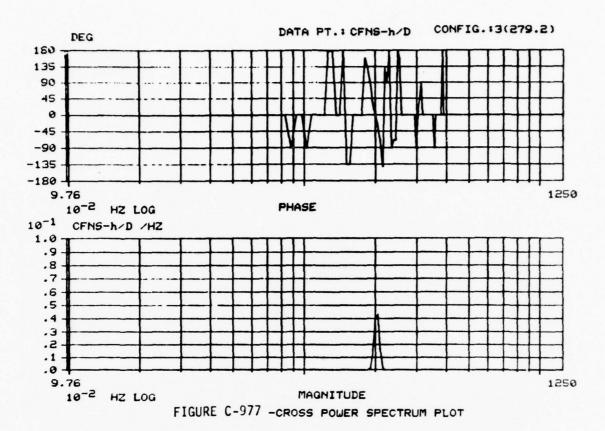


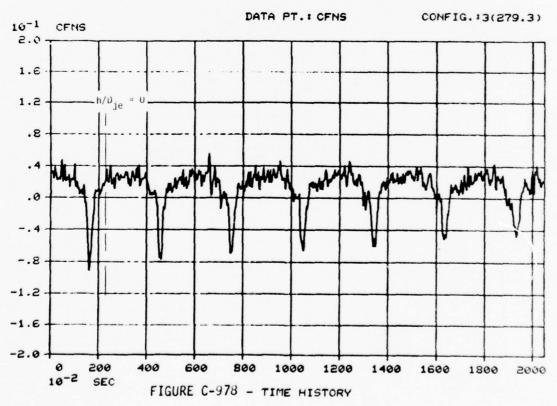


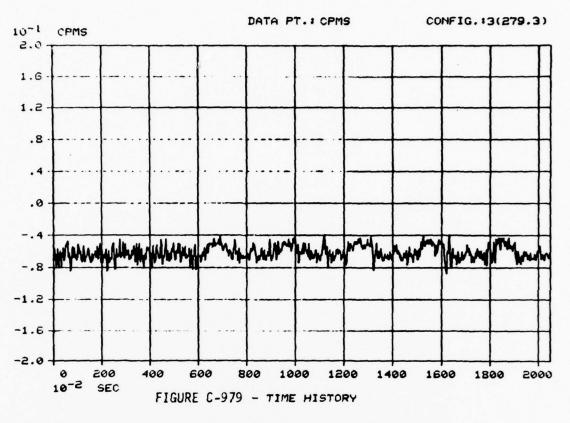


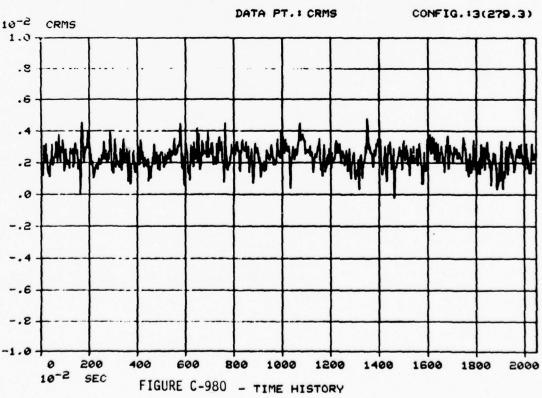


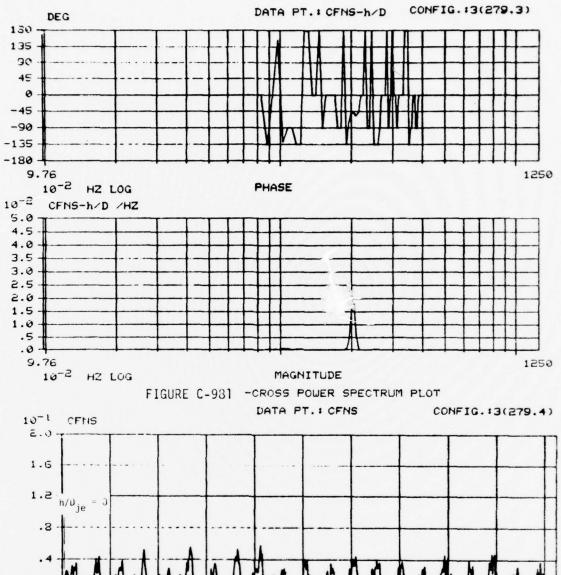


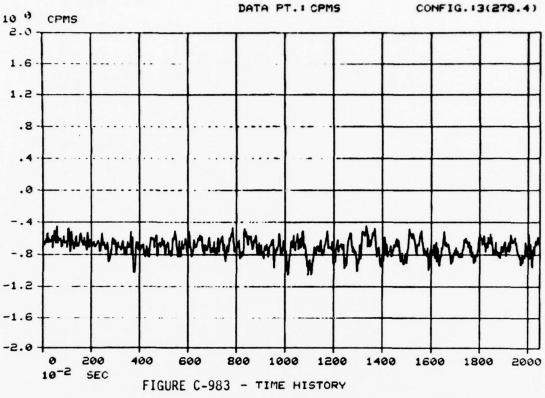


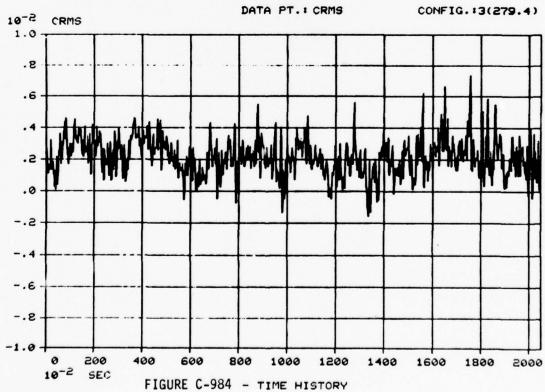


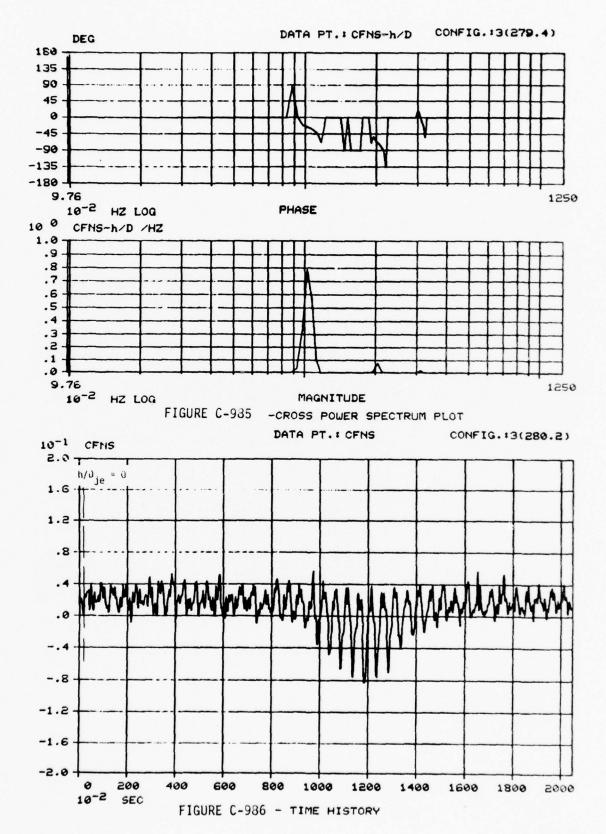


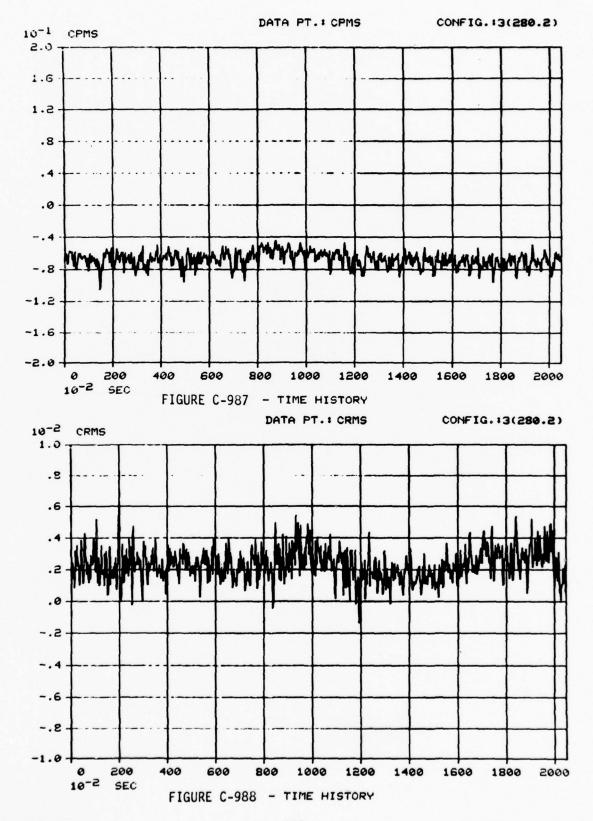


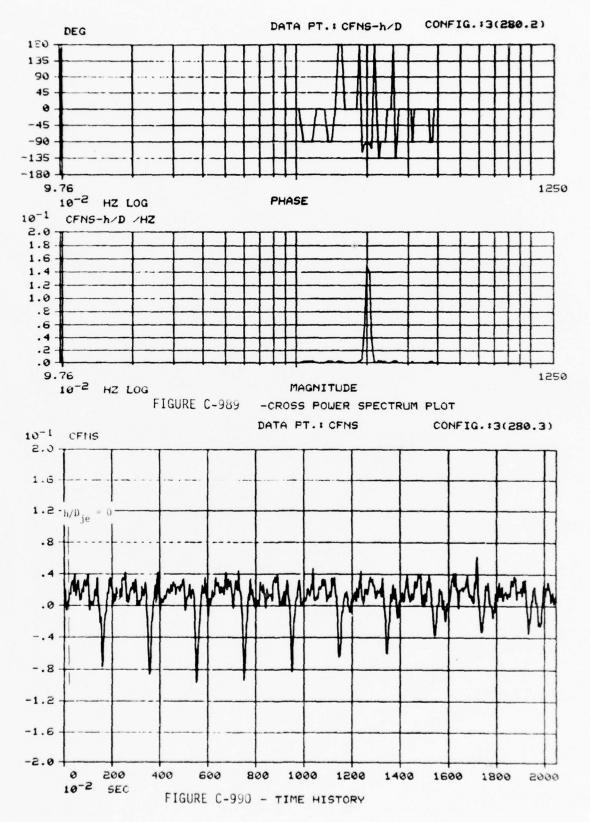


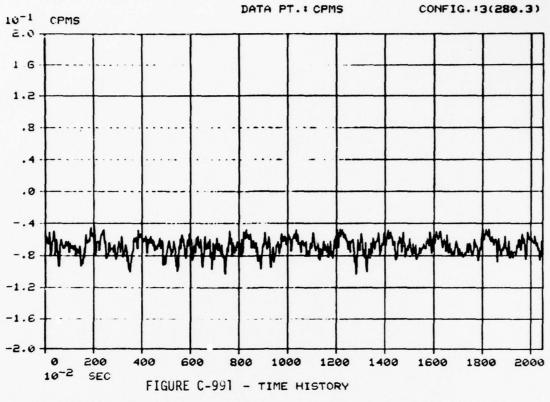


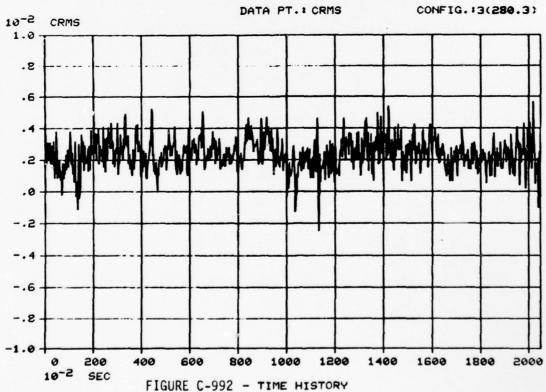


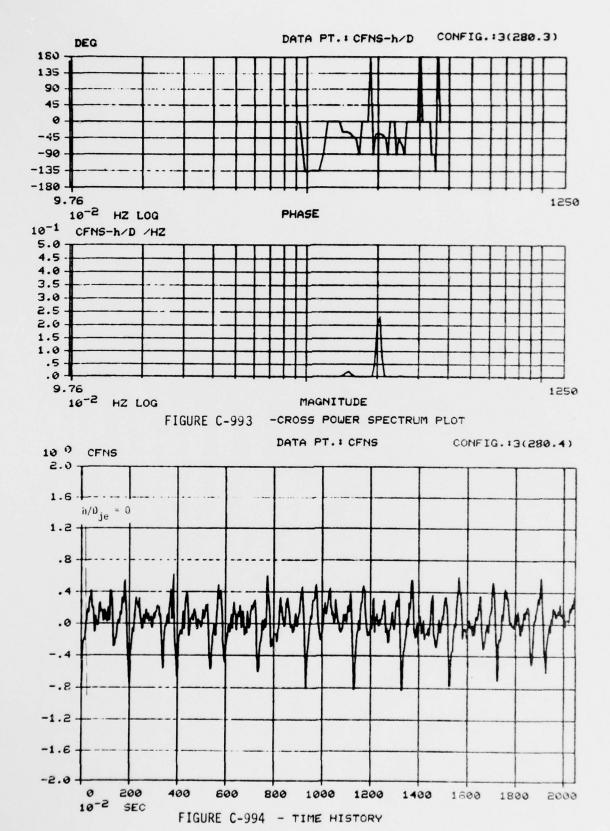


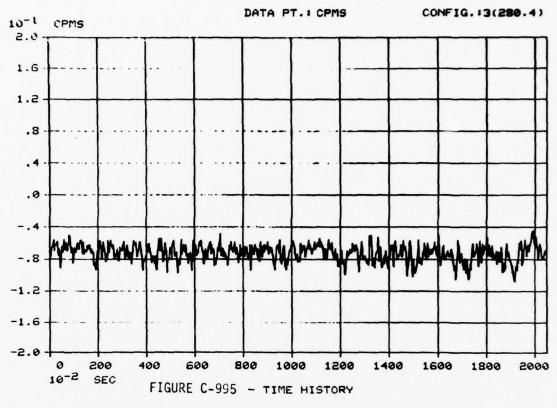


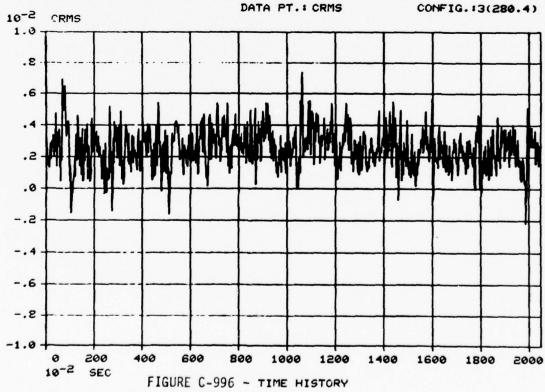


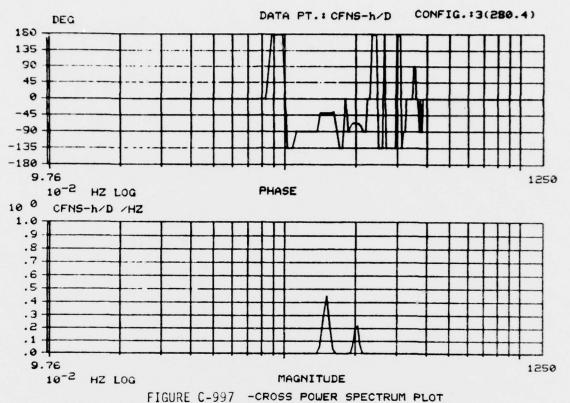




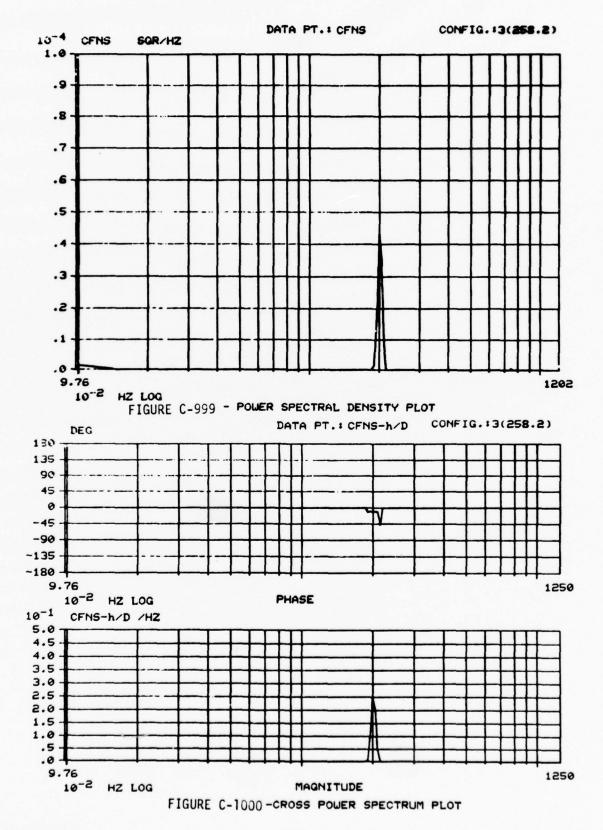


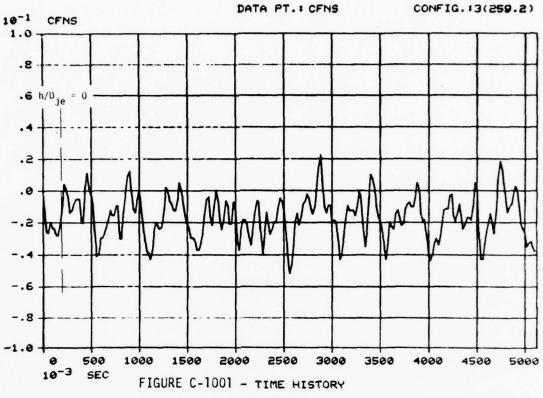


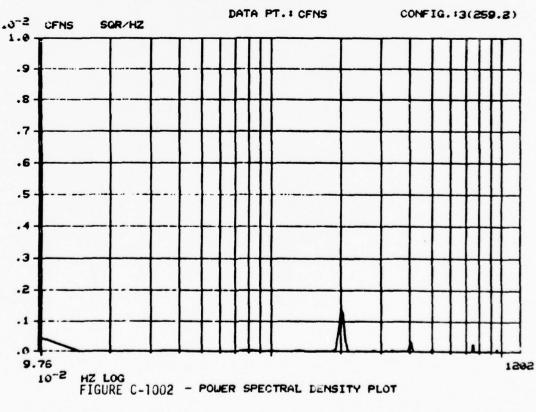


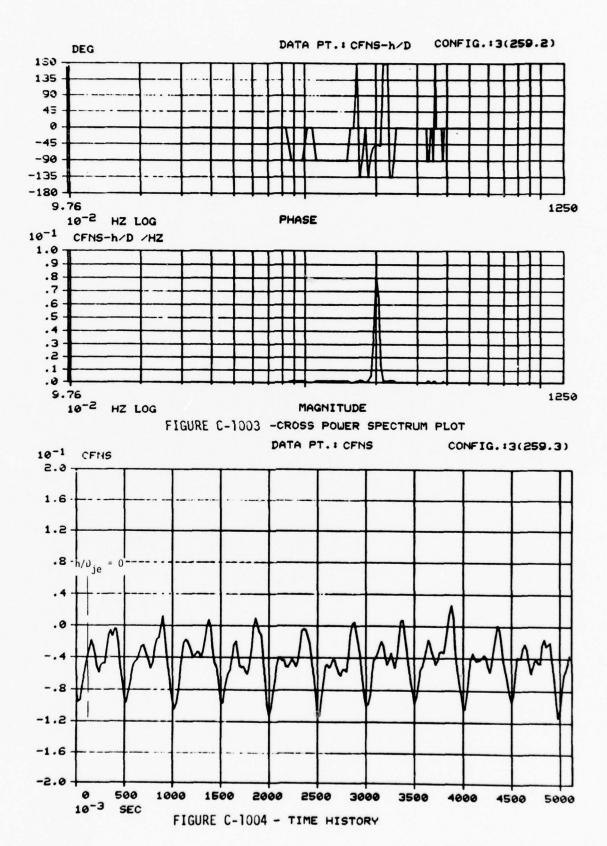


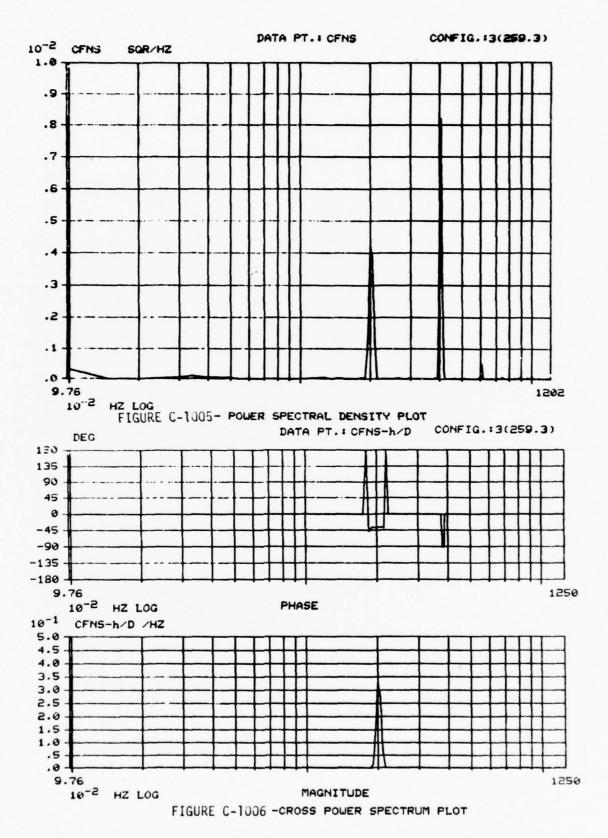
DATA PT.: CFNS CONFIG.:3(258.2) 10-1 CFNS 5.0 4.0 3.0 **2.0**  $h/D_{je} = 0$ 1.0 .0 -1.0 -2.0 -3.0 -4.0 -5.0 -0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-998 - TIME HISTORY

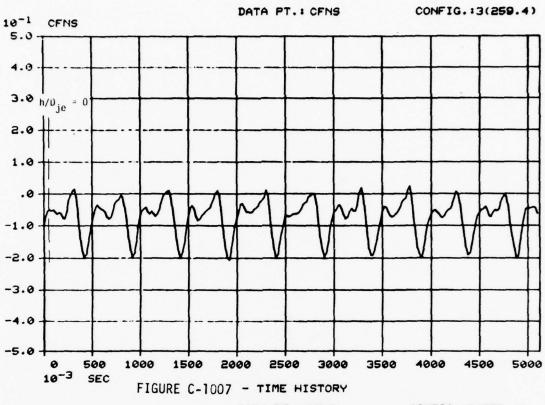


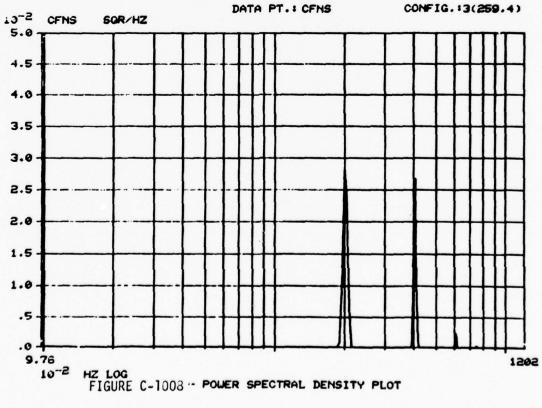


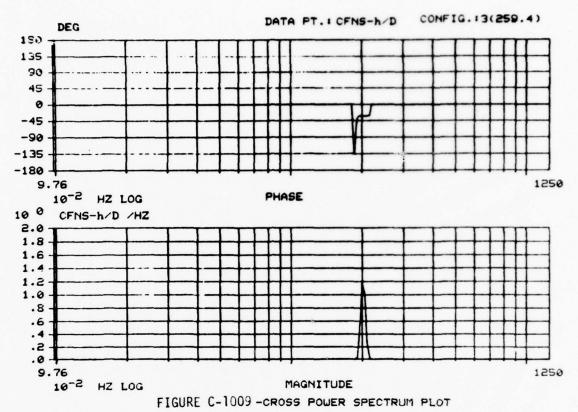


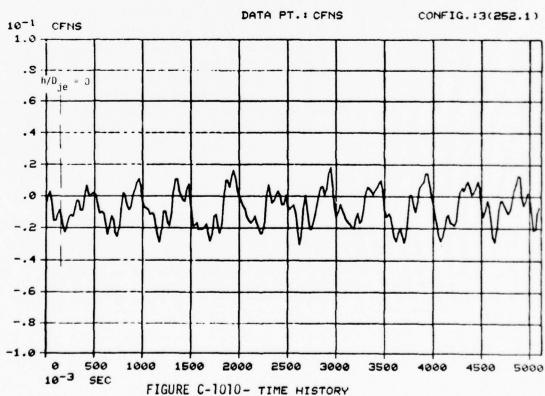


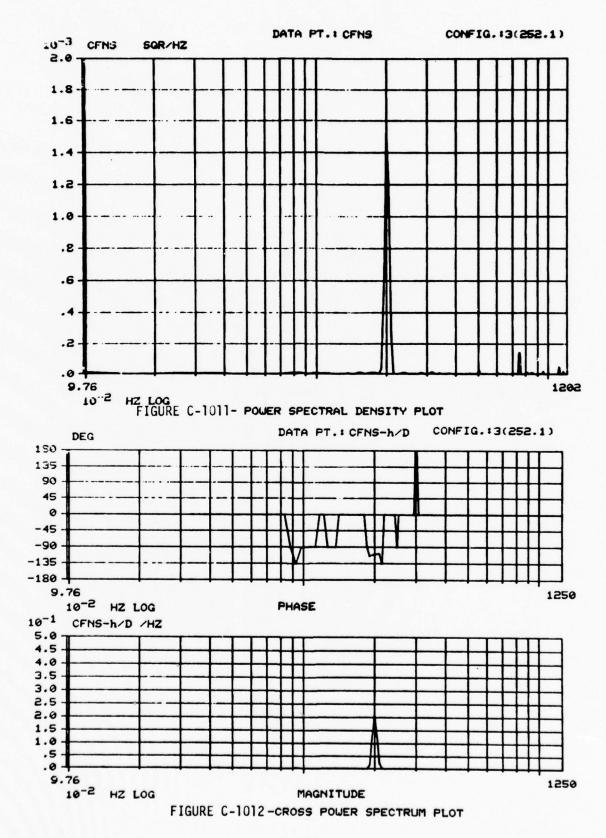


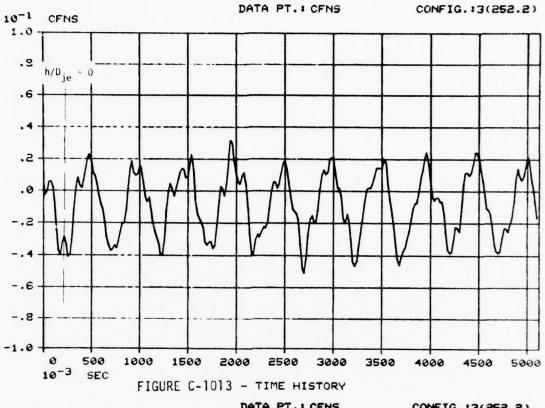


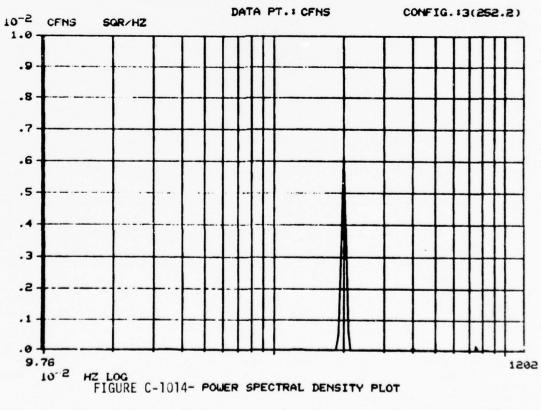


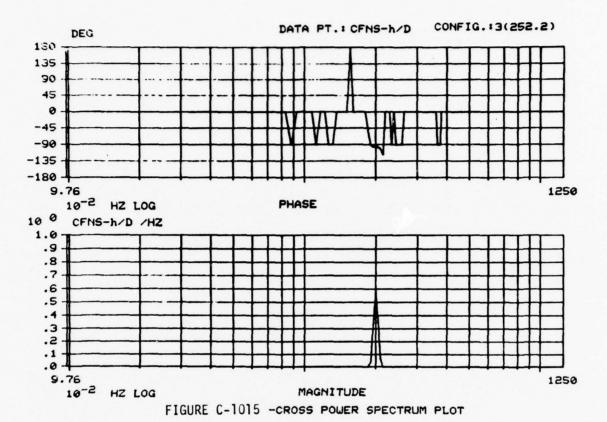












10<sup>-1</sup> CFNS

2.0

1.0 h/D je = 0

-1.0

-2.0

-3.0

2000 2500

FIGURE C-1016 - TIME HISTORY

3000

3500

4000

4500

5000

-4.0

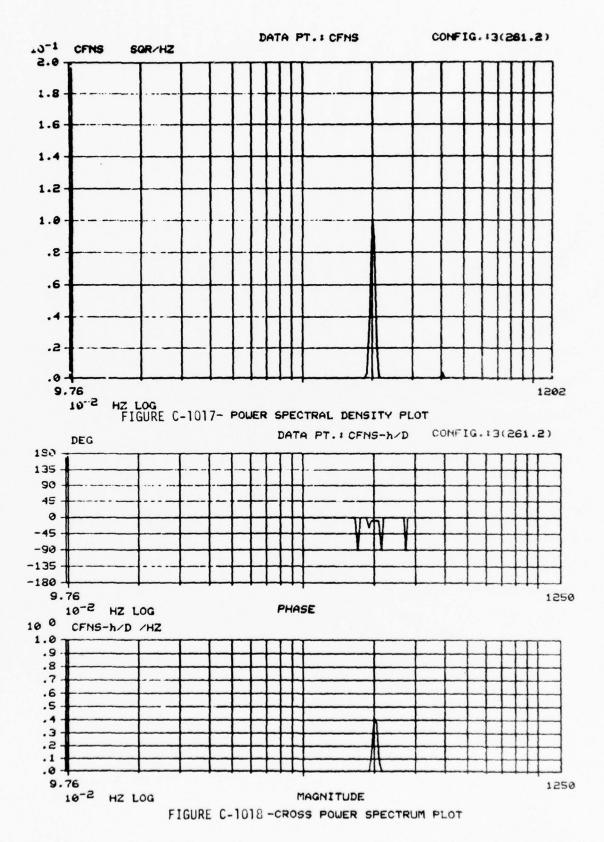
-5.0

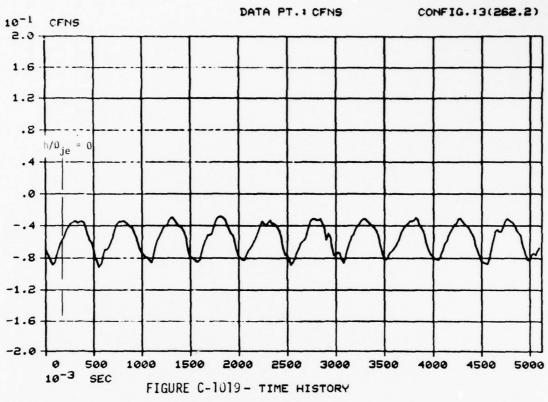
500

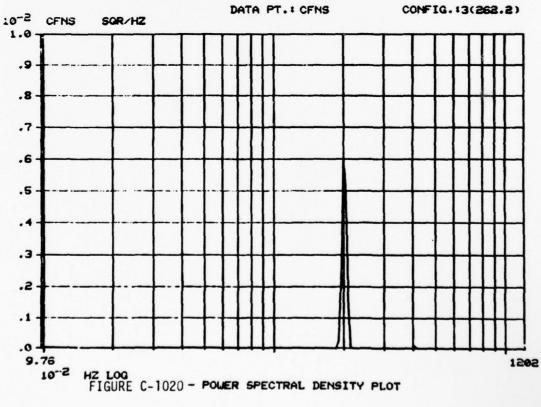
10-3 SEC

1000

1500







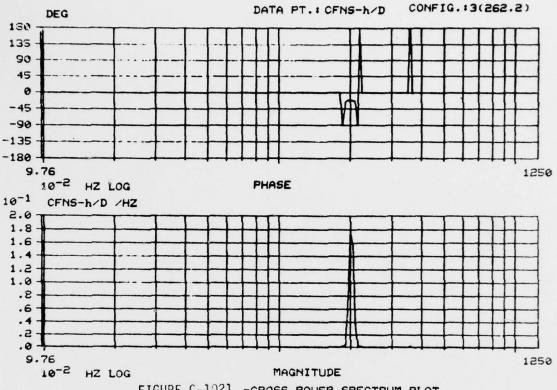


FIGURE C-1021 -cross POWER SPECTRUM PLOT

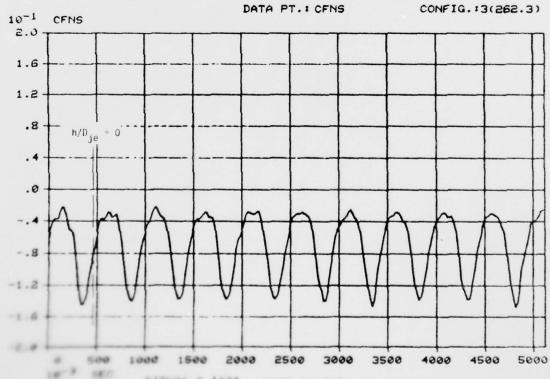
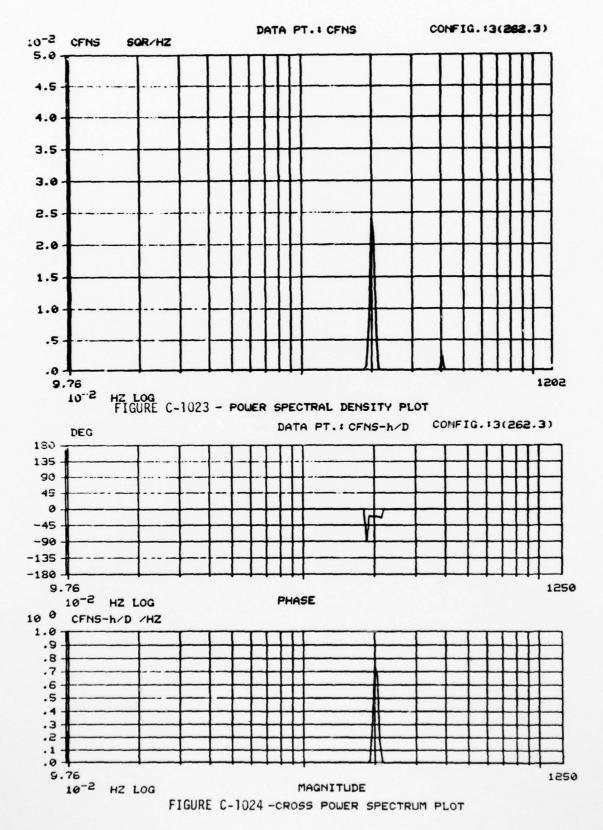
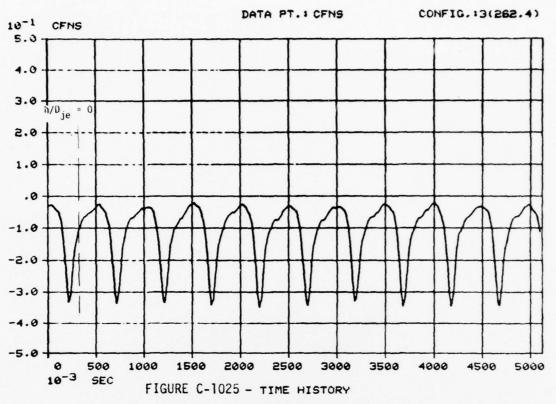
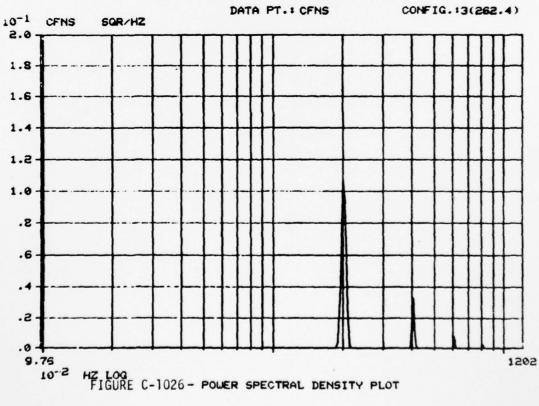


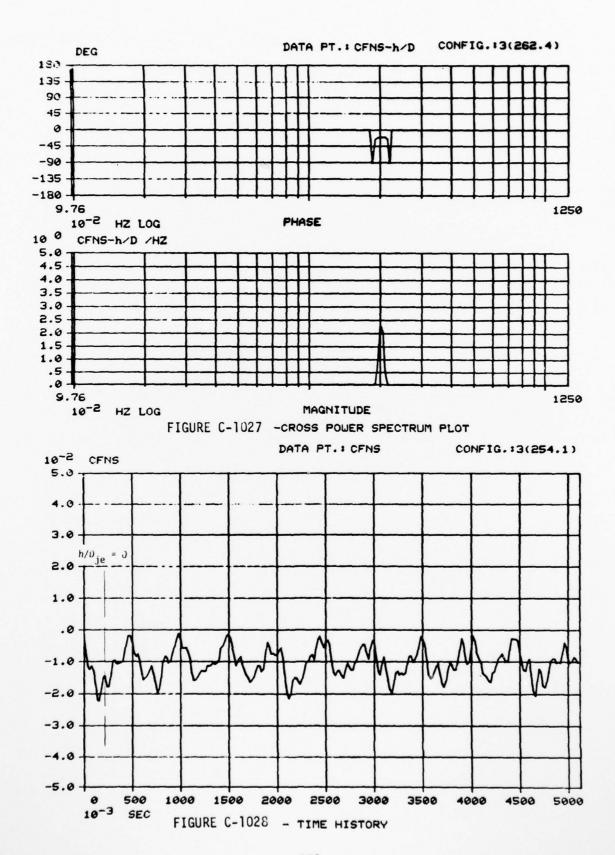
FIGURE C-1022 - TIME HISTORY

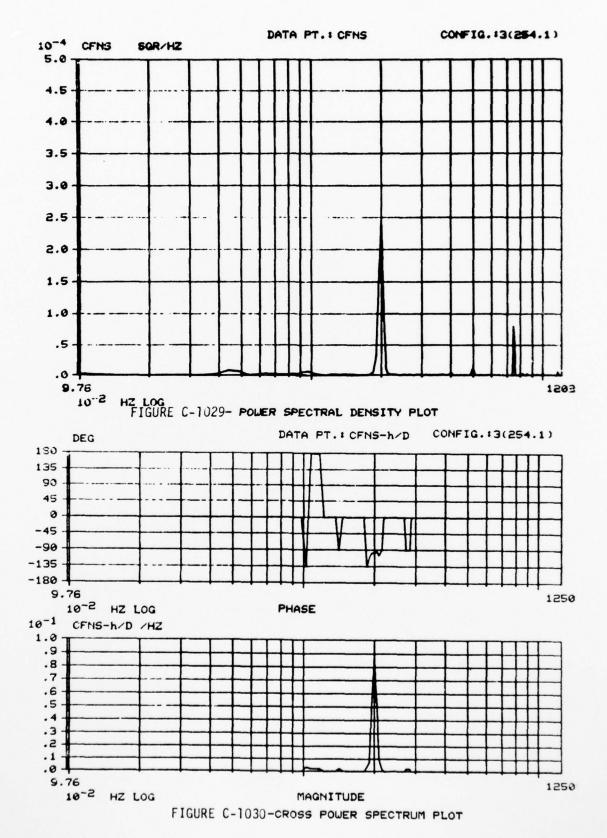
649

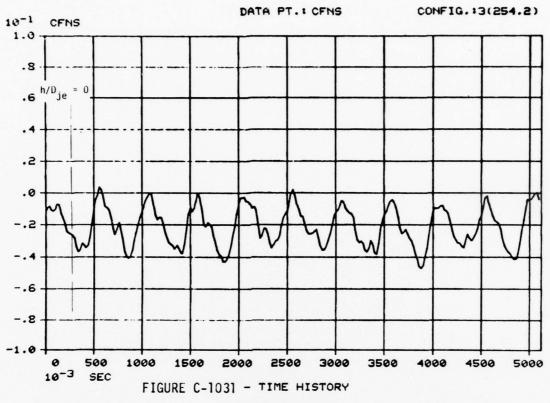


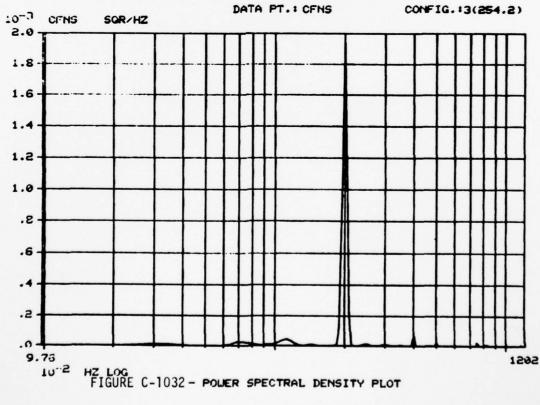


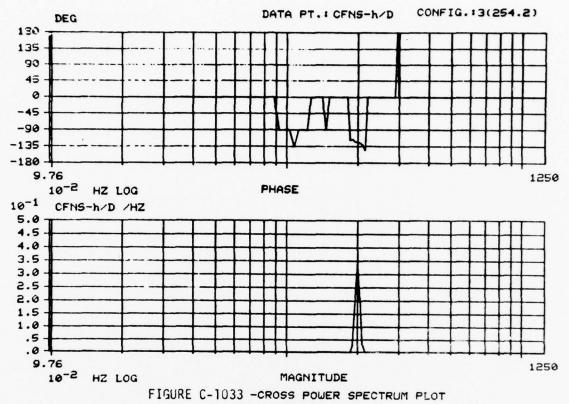


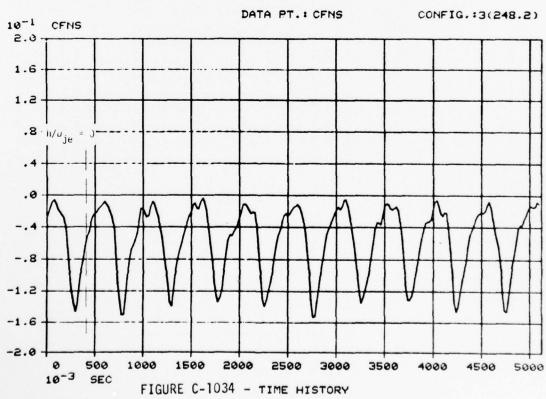


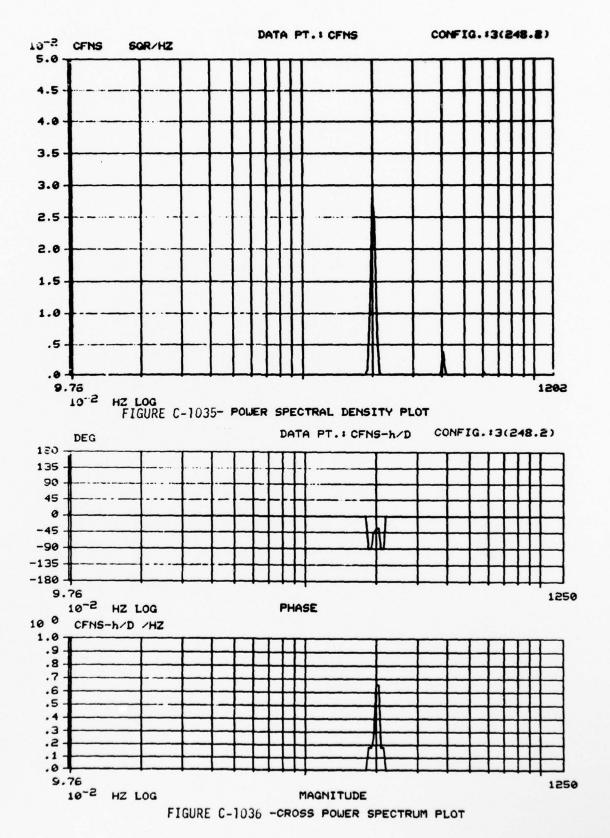


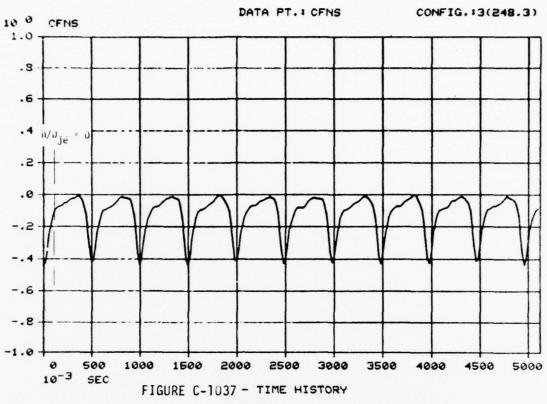


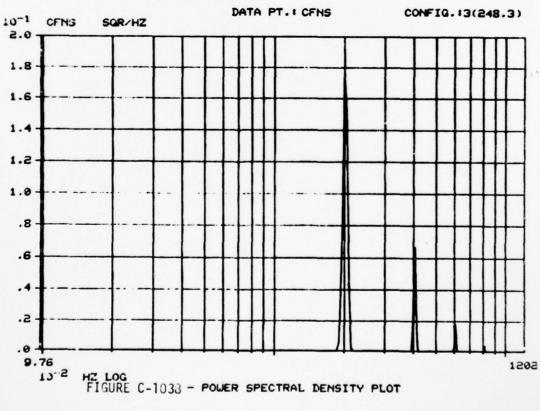


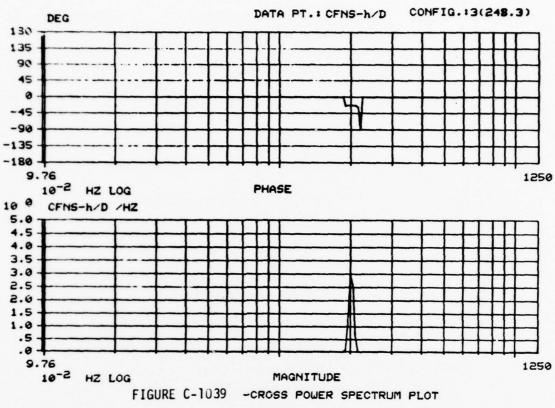


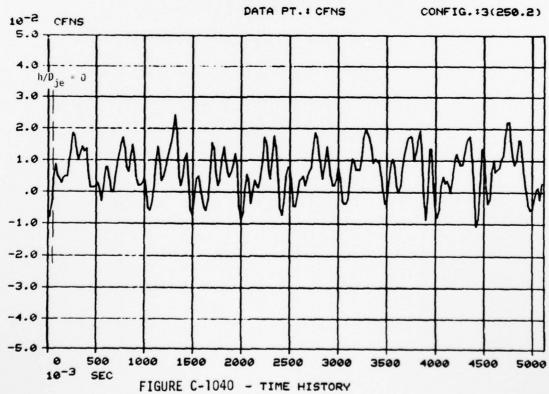


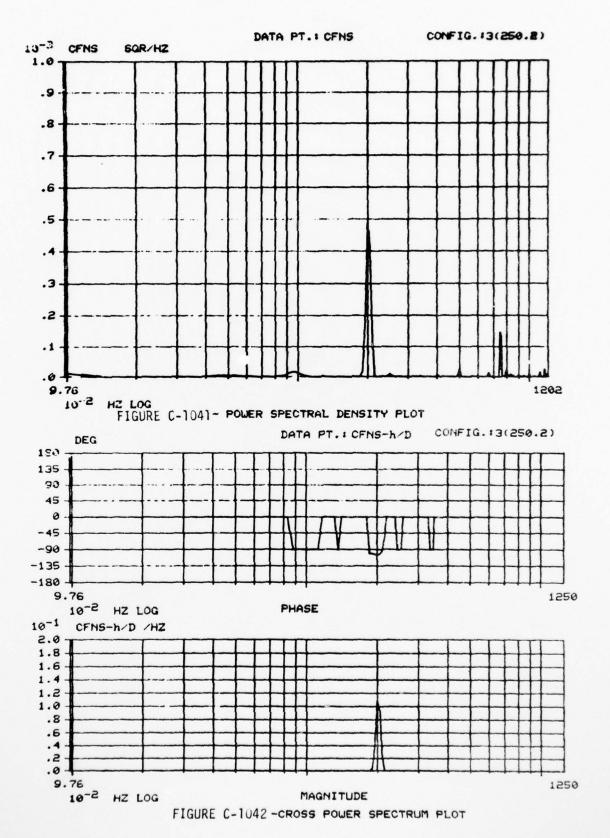


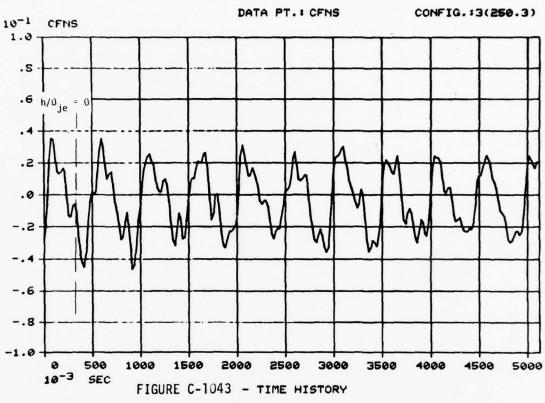


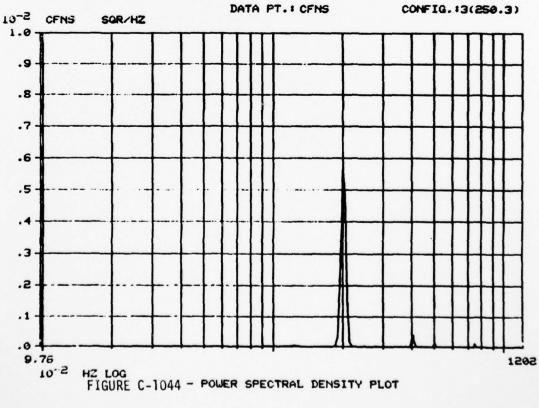


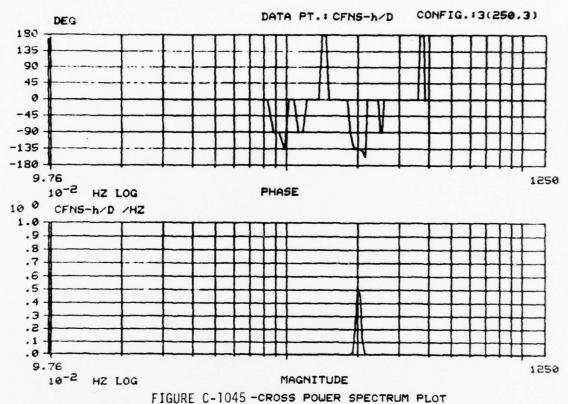




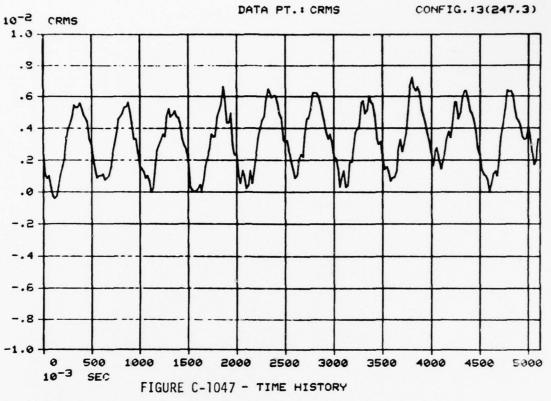


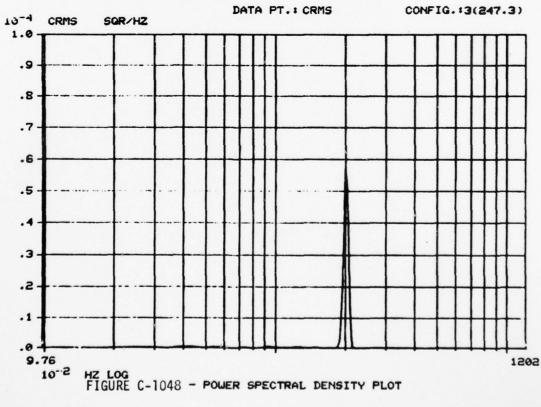


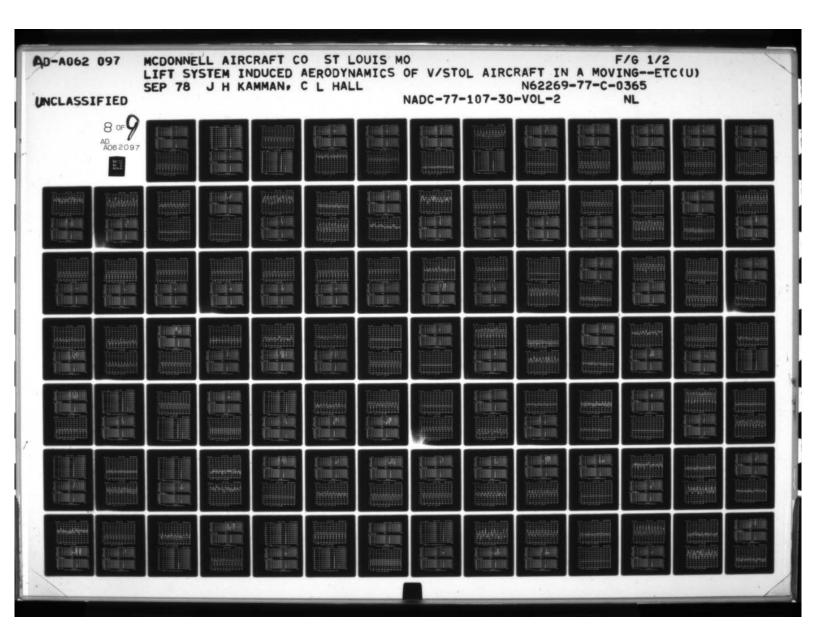




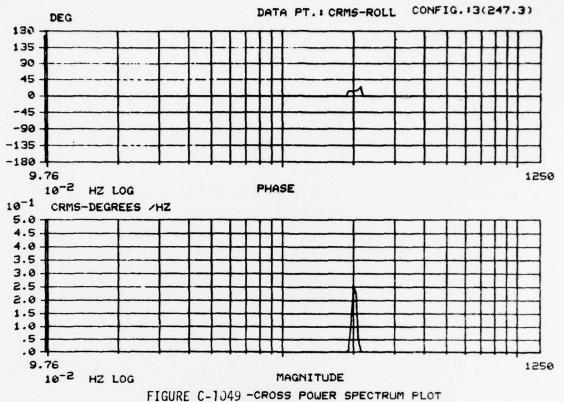
DATA PT.: CFNS CONFIG. 13(247.3) 10-1 CFNS 2.0-1.6 1.2 .2  $\gamma = 0$ .0 -.8 -1.2 -1.6 -2.0 -0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-1046 - TIME HISTORY











DATA PT. : CFNS CONFIG.:3(264.2) 10-1 CFNS 2.0 1.6 1.2-.2 .4  $h/D_{je} = 0$ .0 -.8 -1.2--1.6 -2.0-1500 2000 2500 500 1000 3000 3500 4000 4500 5000 10-3 SEC FIGURE C-1050 - TIME HISTORY

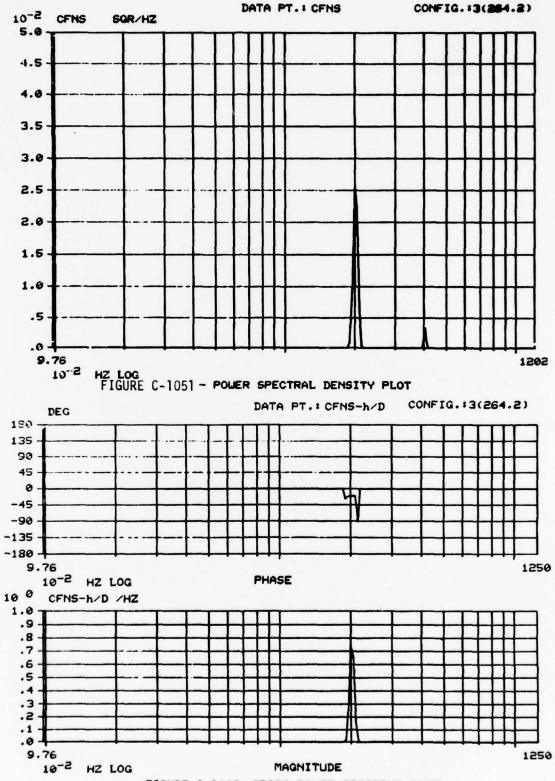
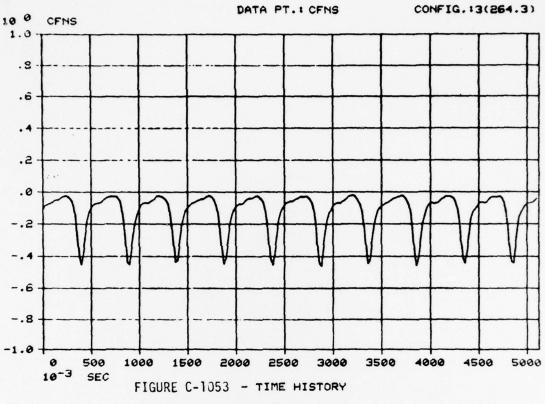
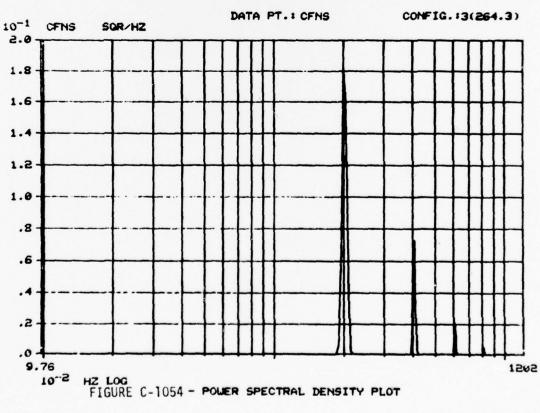
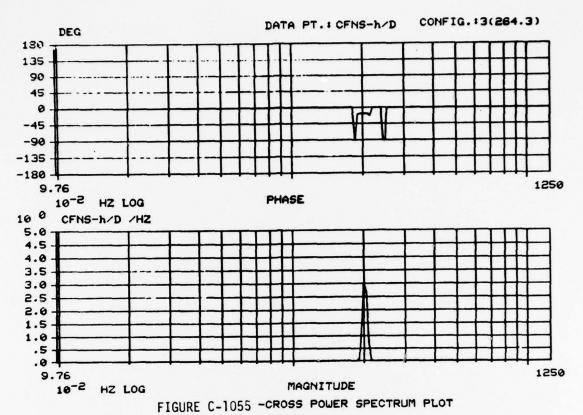
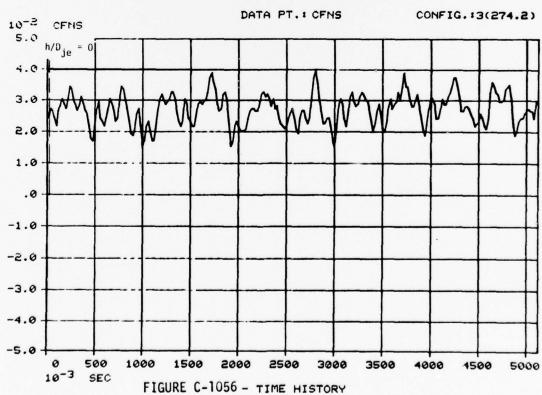


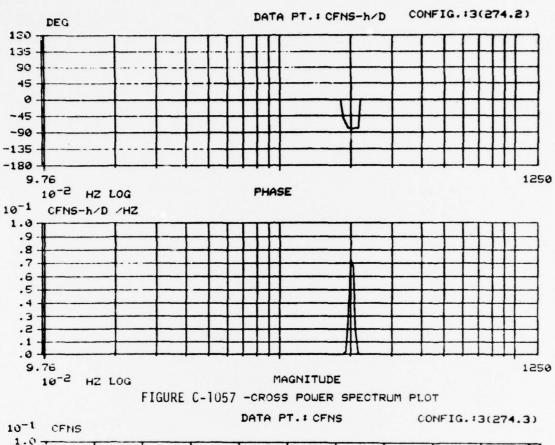
FIGURE C-1052 -CROSS POWER SPECTRUM PLOT

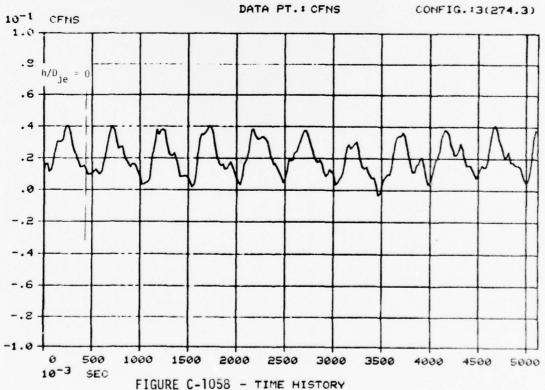












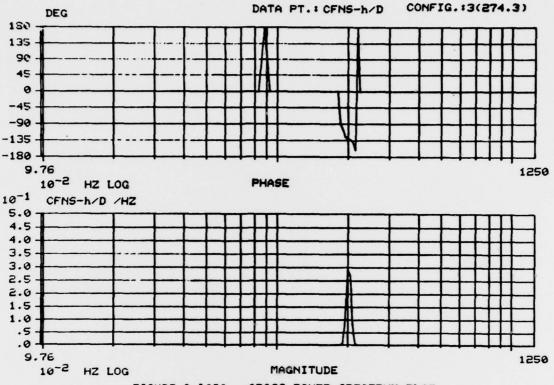
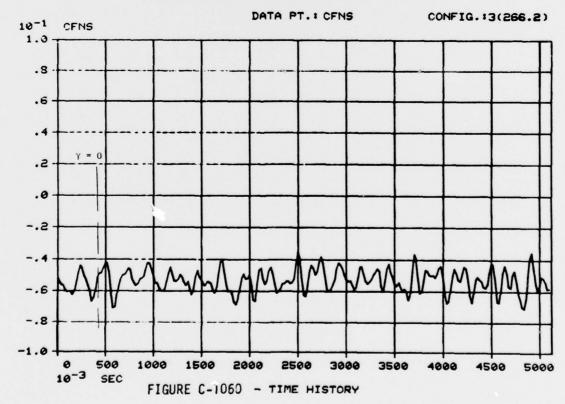
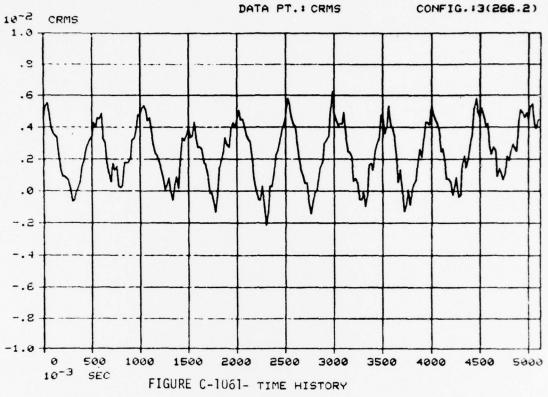
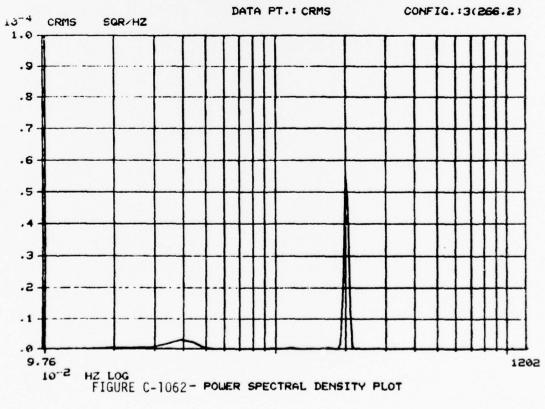
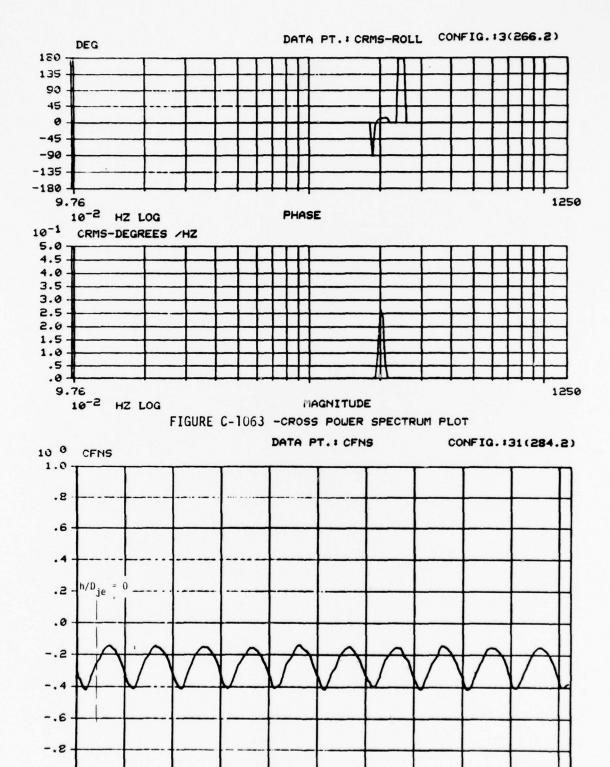


FIGURE C-1059 -CROSS POWER SPECTRUM PLOT







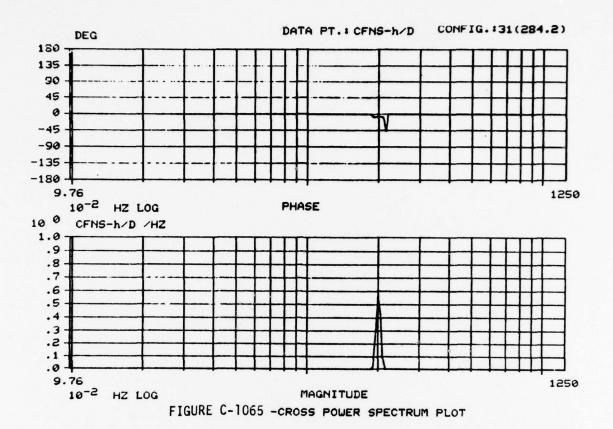


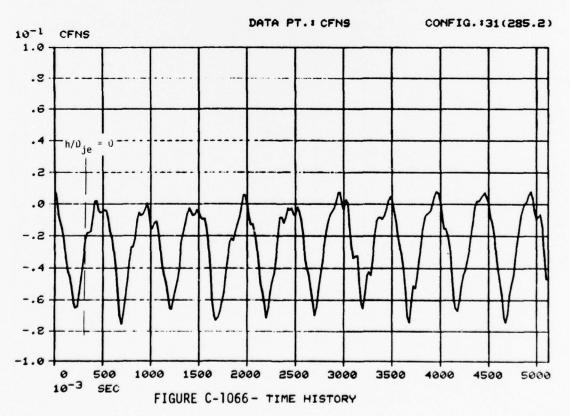
3500 4000

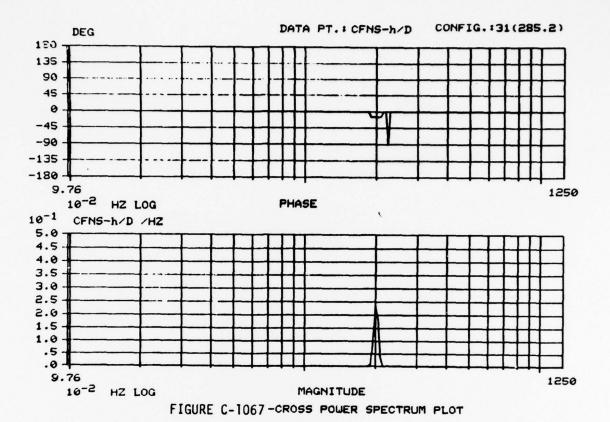
-1.0+

10-3 SEC

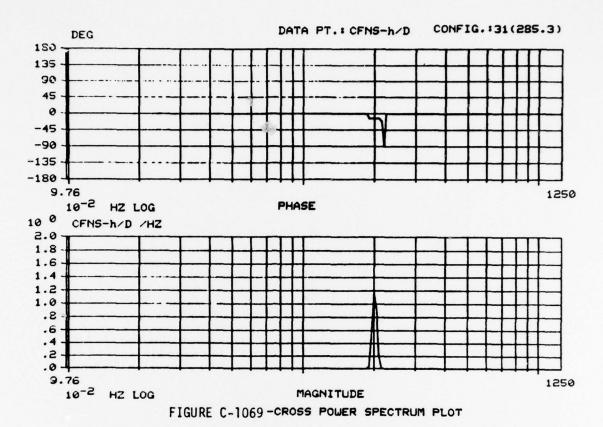
FIGURE C-1064 - TIME HISTORY

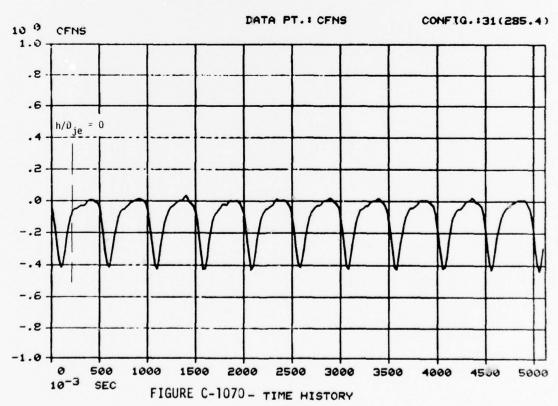


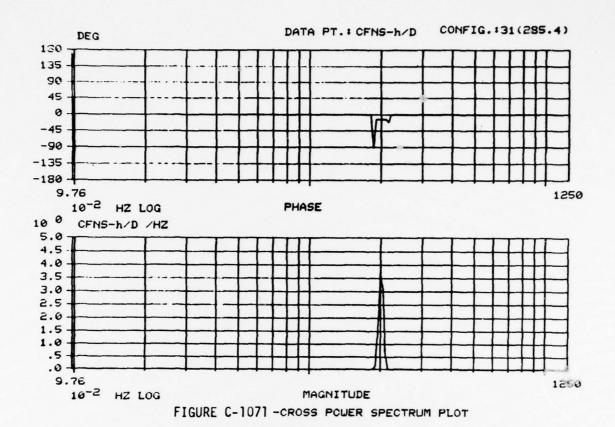


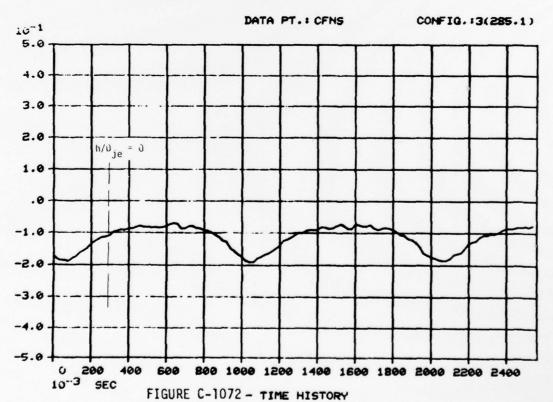


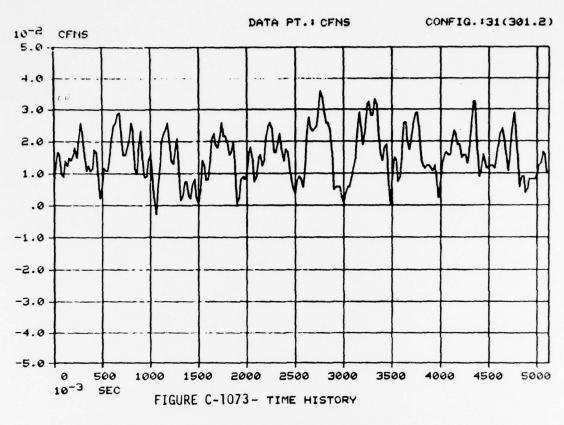
DATA PT.: CFNS CONFIG. :31(285.3) 10-1 CFNS 2.0 -1.6 1.2 $h/D_{je} = 0$ .8 .4 .0 -.4 -.8--1.2--1.6 -2.0+ 3000 500 1500 2000 2500 1000 3500 4000 4500 5000 10-3 SEC FIGURE C-1068 - TIME HISTORY

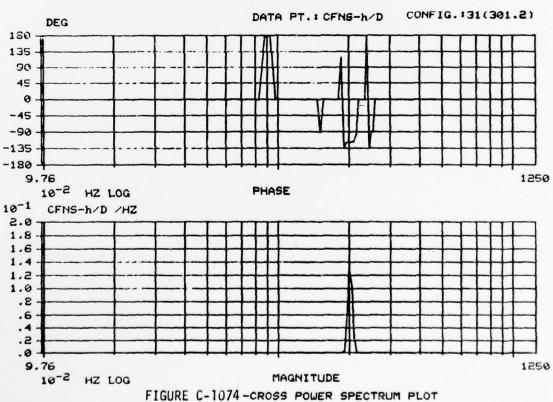


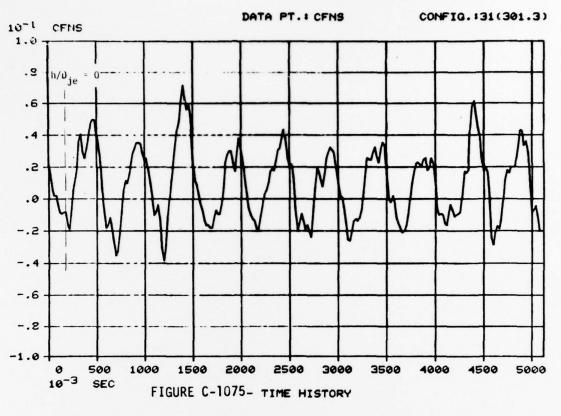












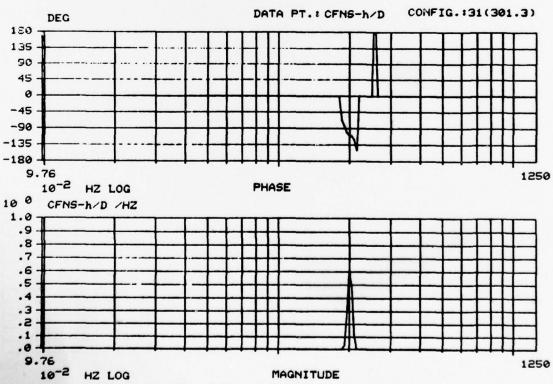
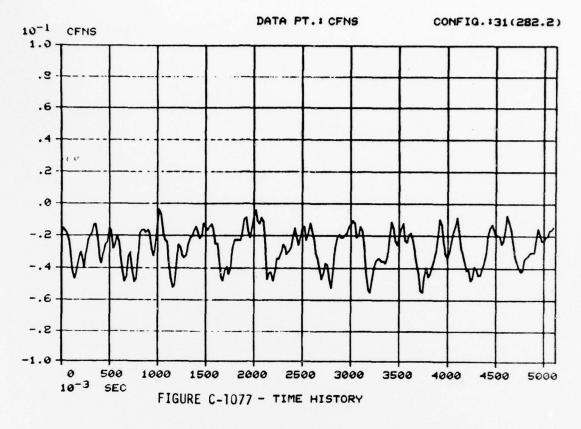
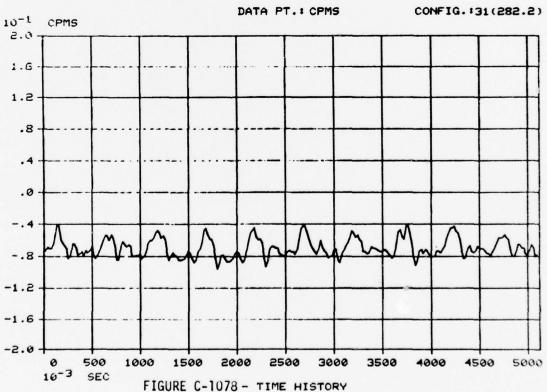
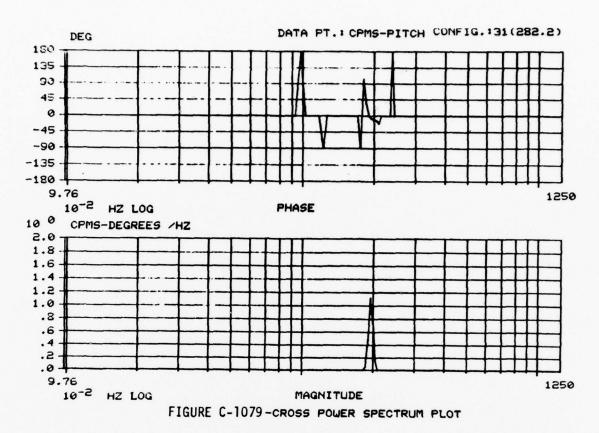
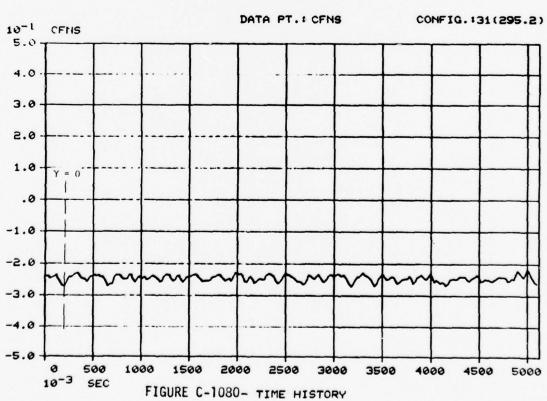


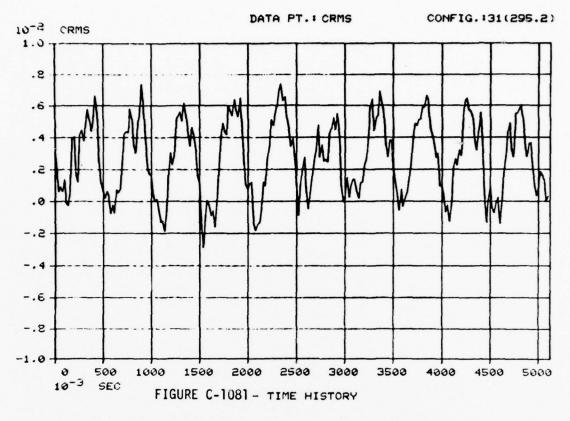
FIGURE C-1076 -CROSS POWER SPECTRUM PLOT











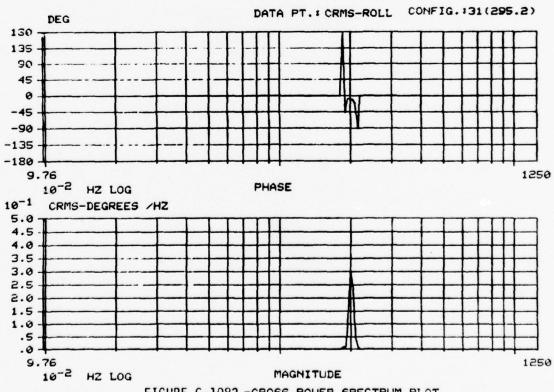
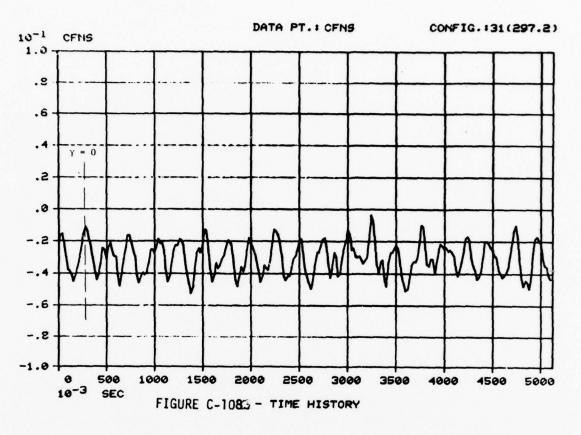
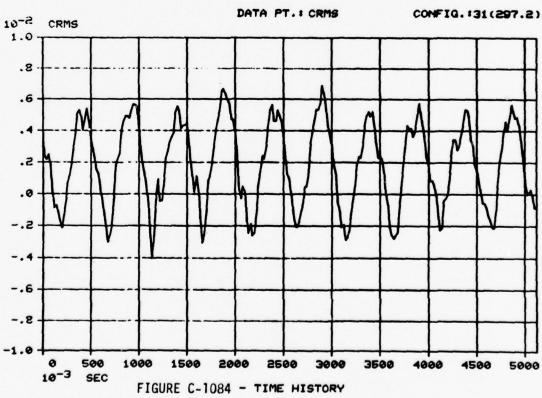
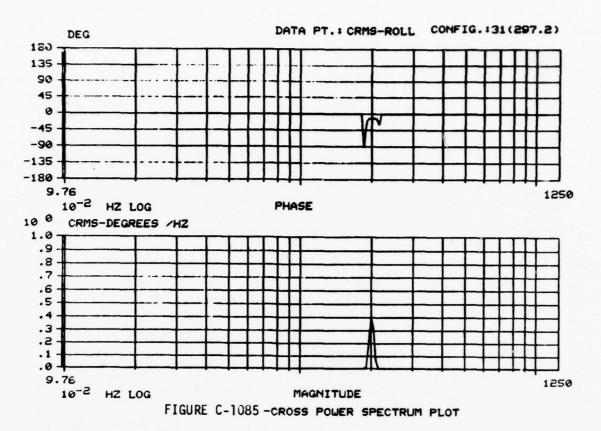
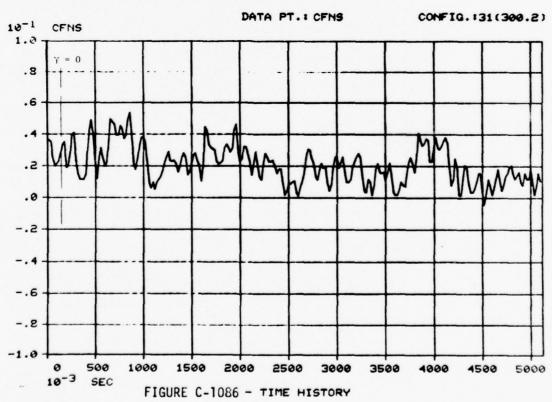


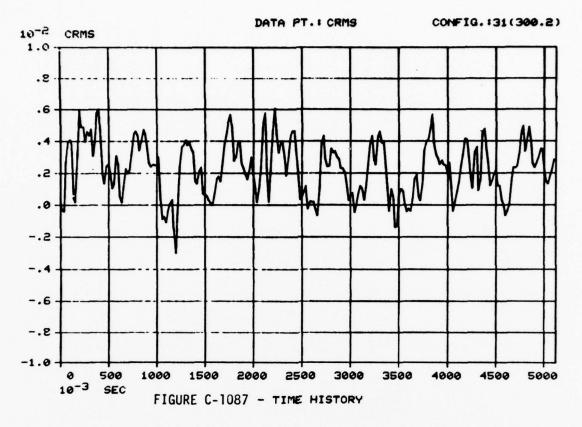
FIGURE C-1082 -CROSS POWER SPECTRUM PLOT











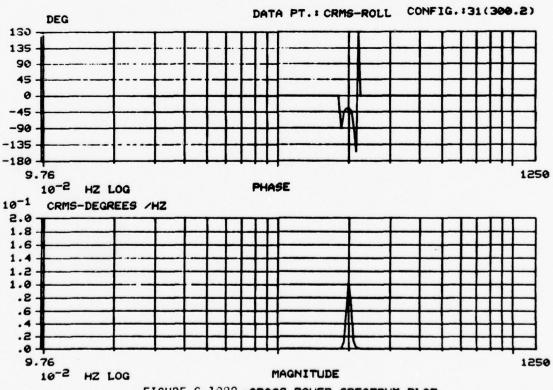
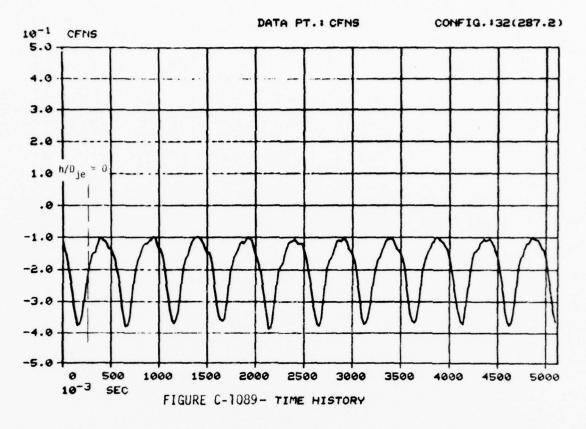
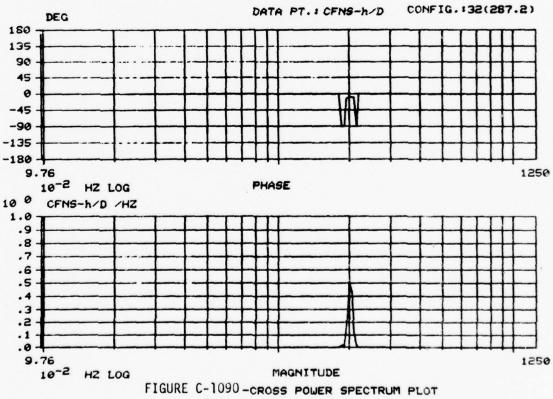
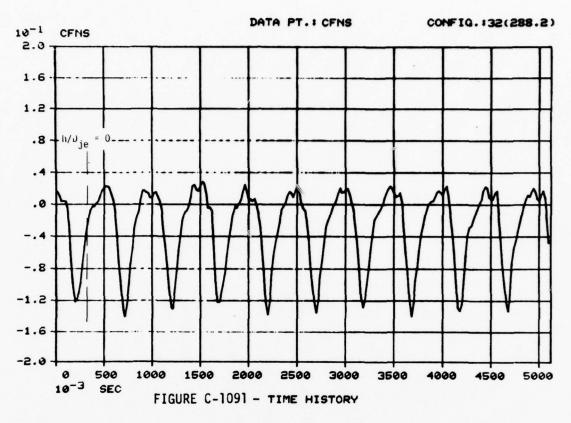
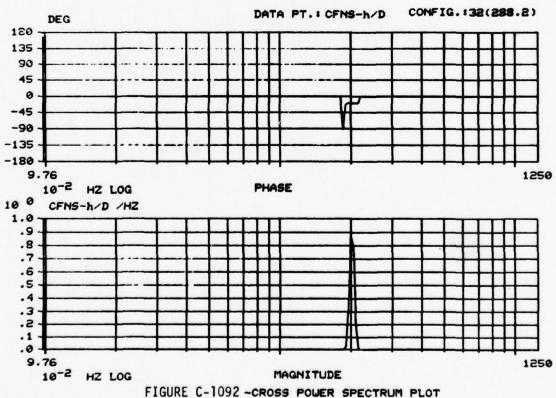


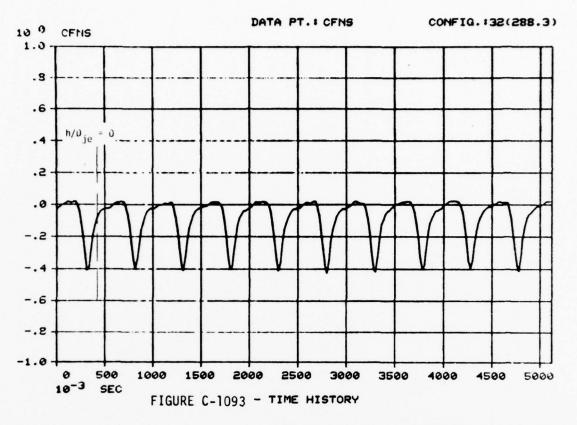
FIGURE C-1088 -CROSS POWER SPECTRUM PLOT

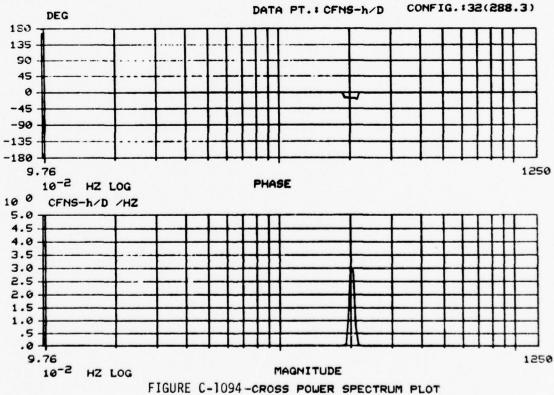


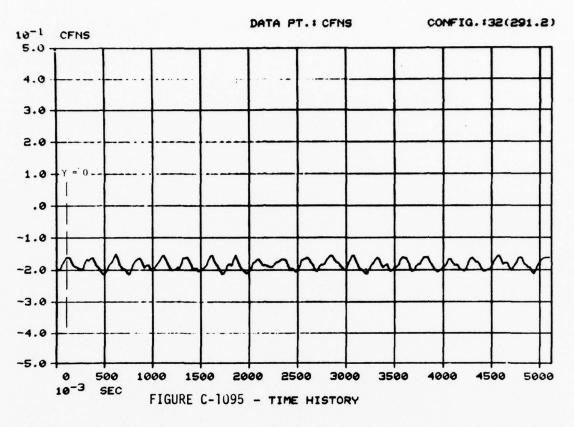


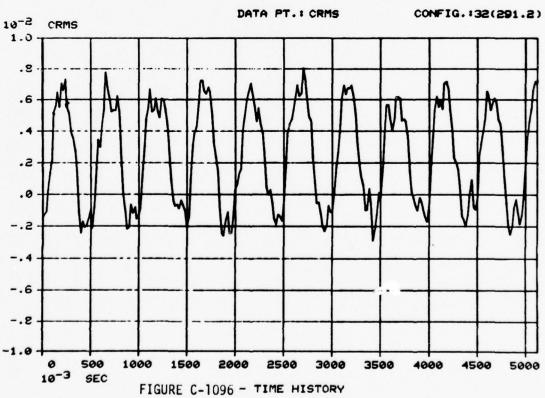


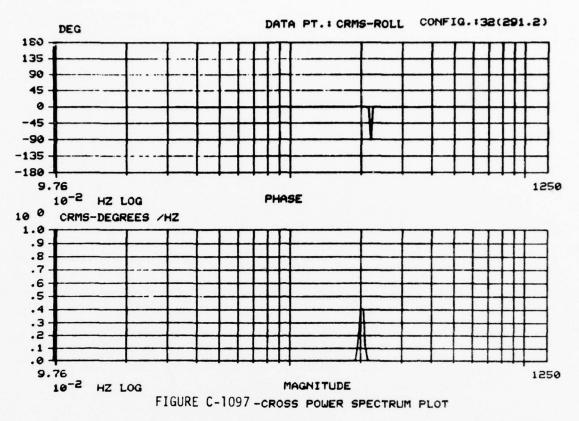


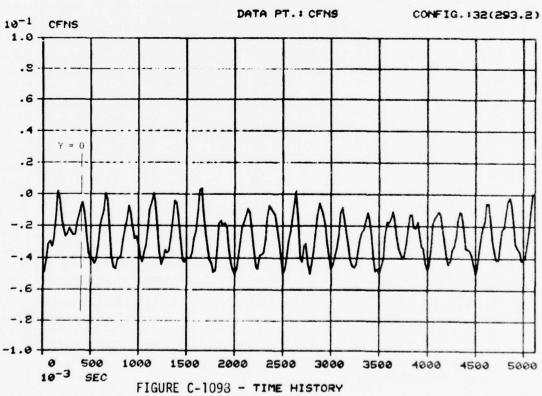


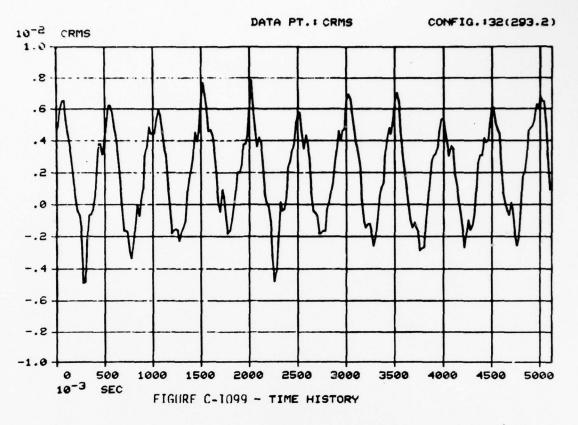


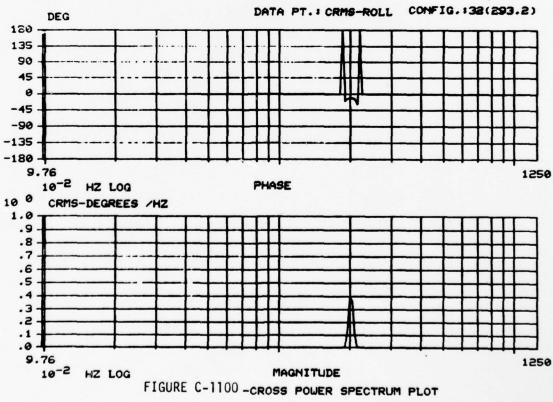


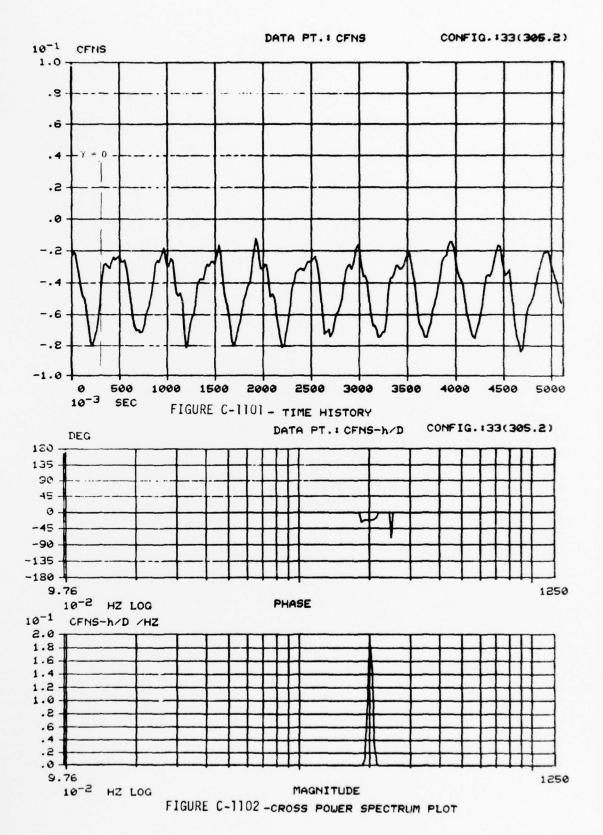


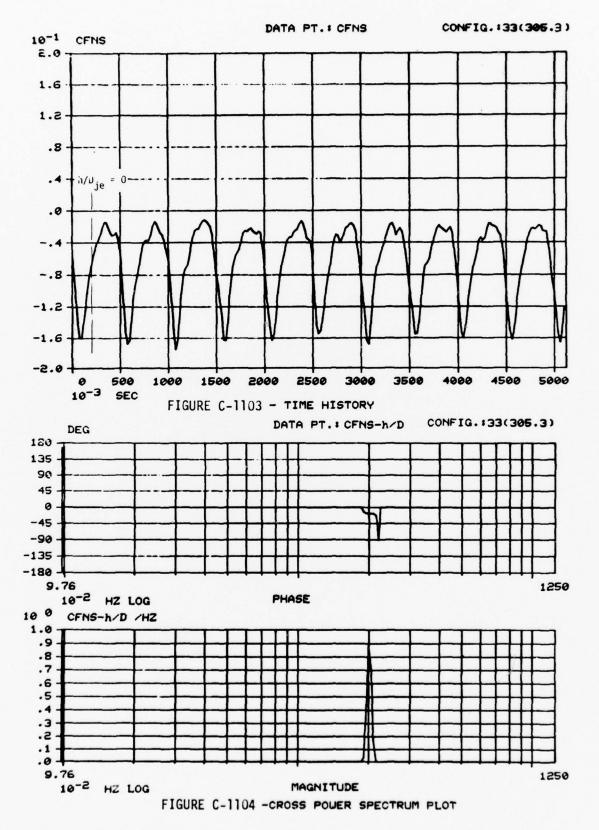


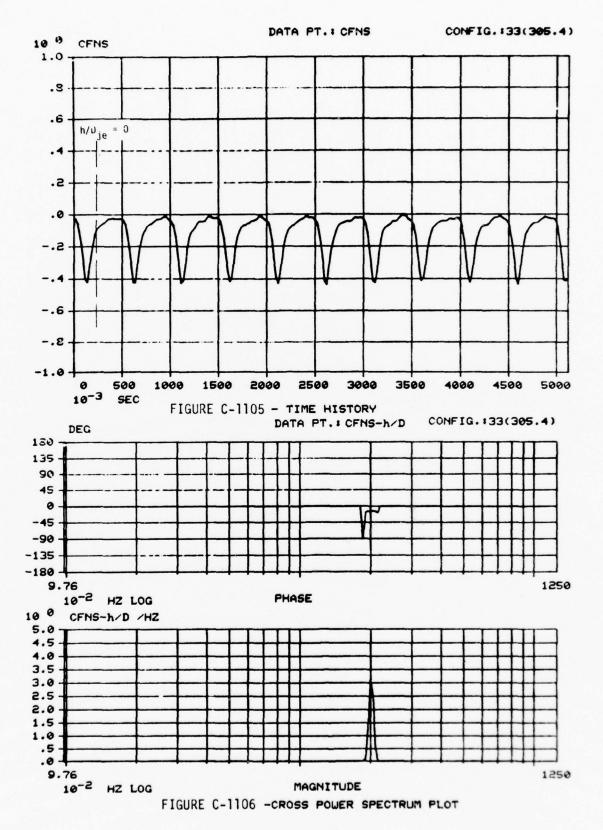


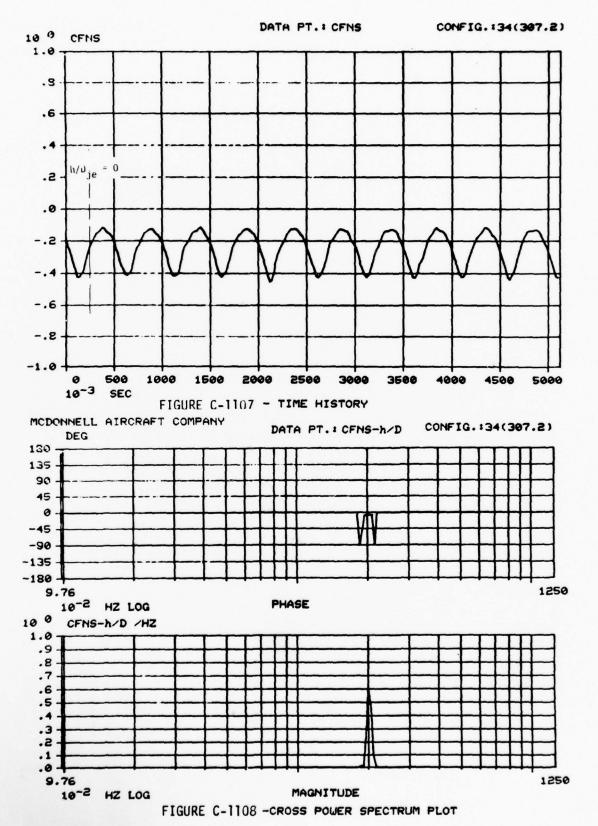


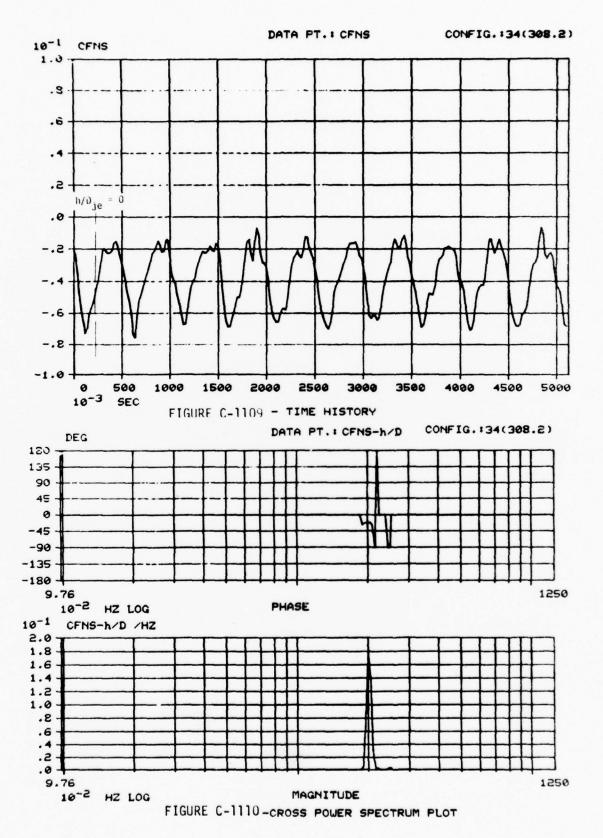


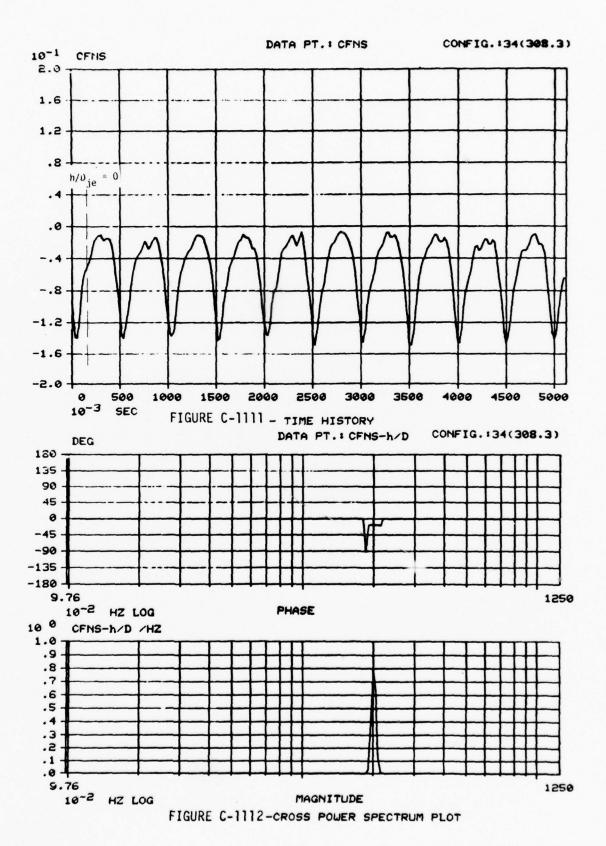


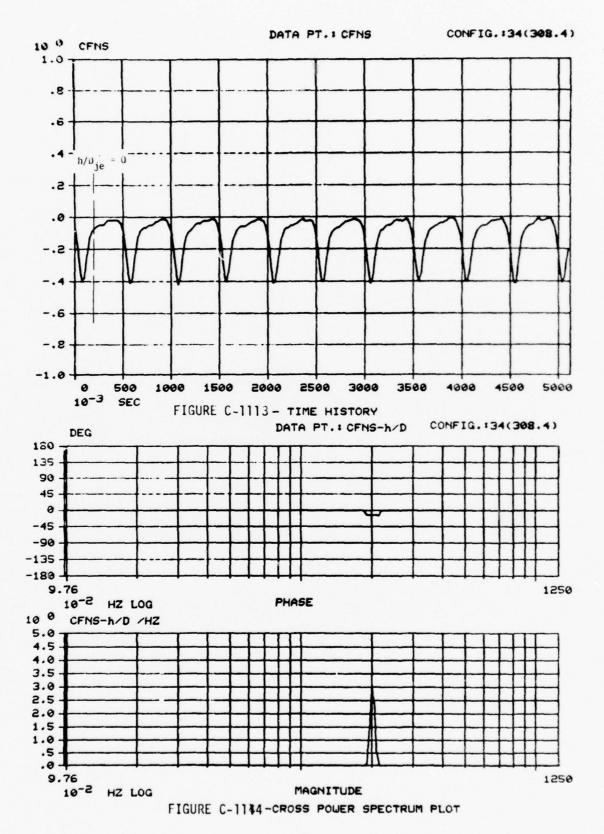


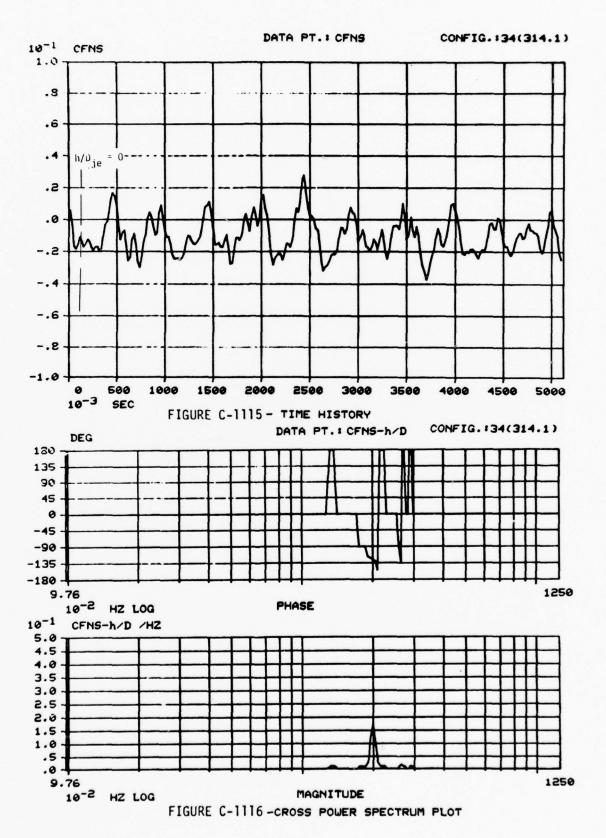


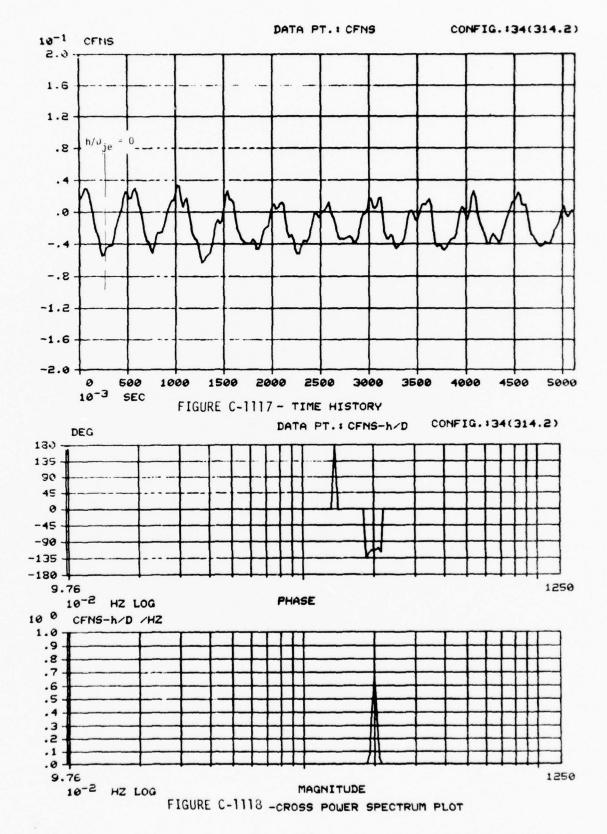


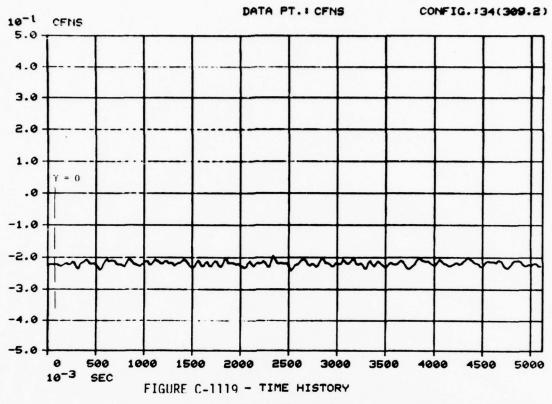


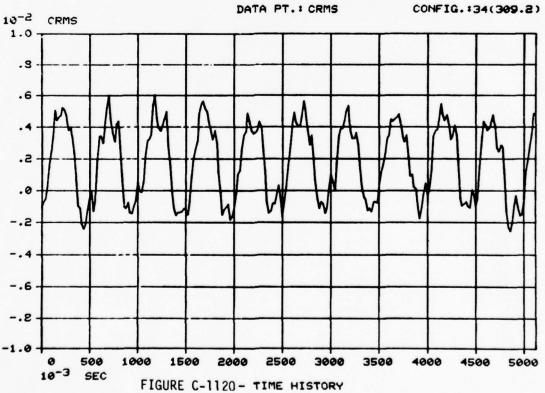


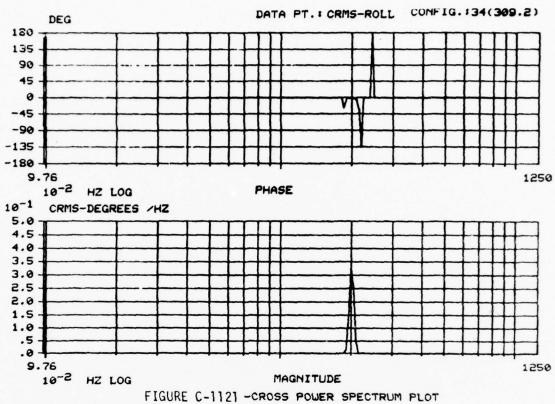




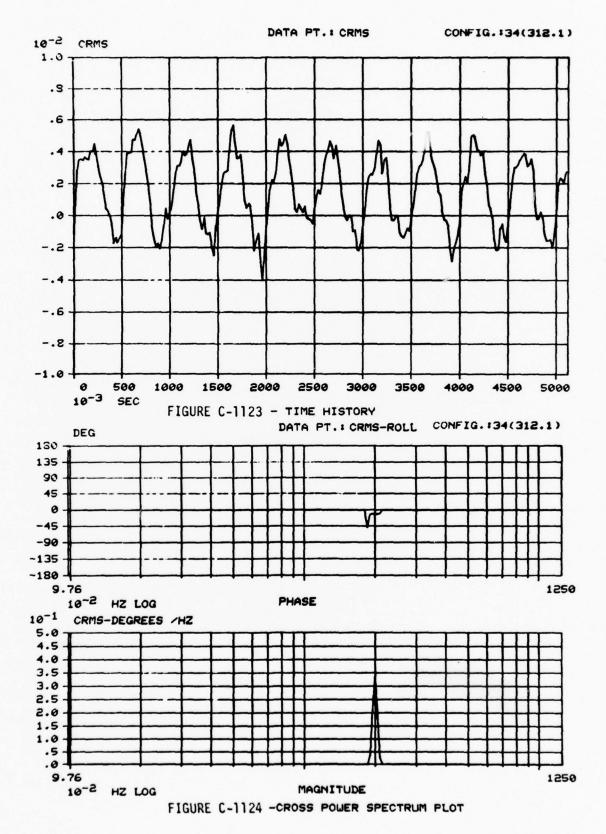


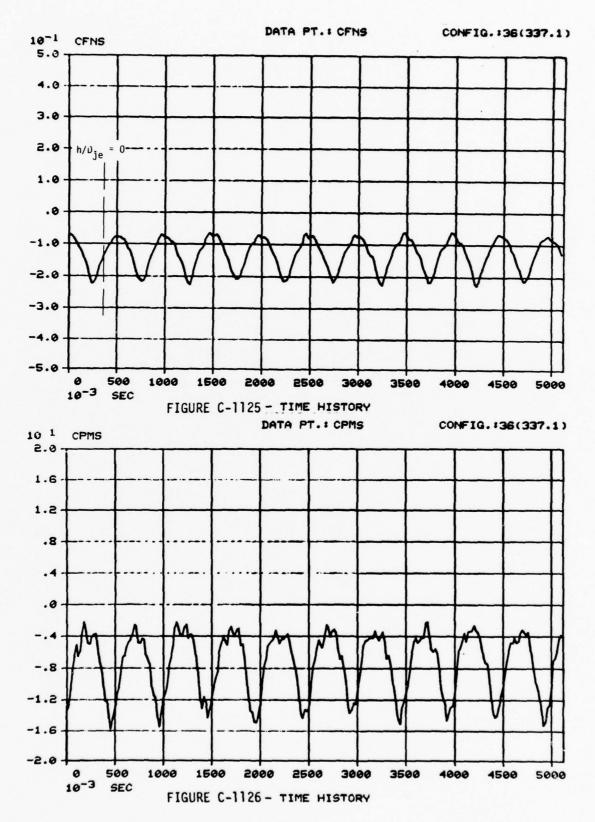


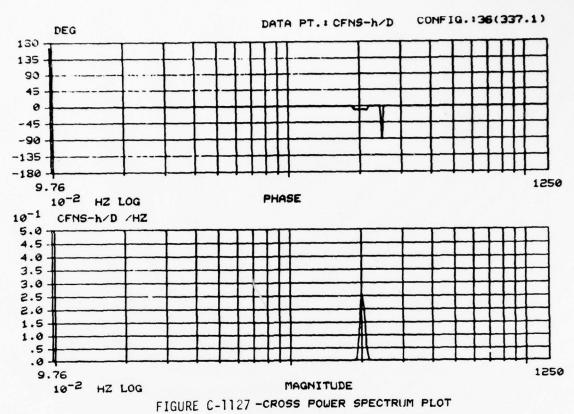




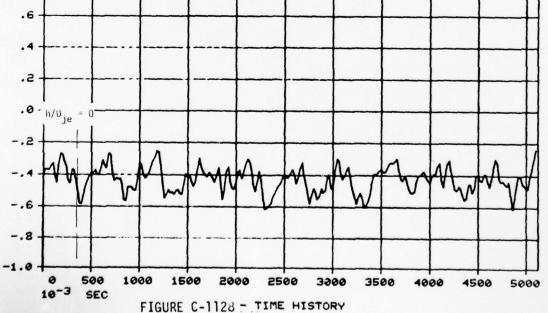
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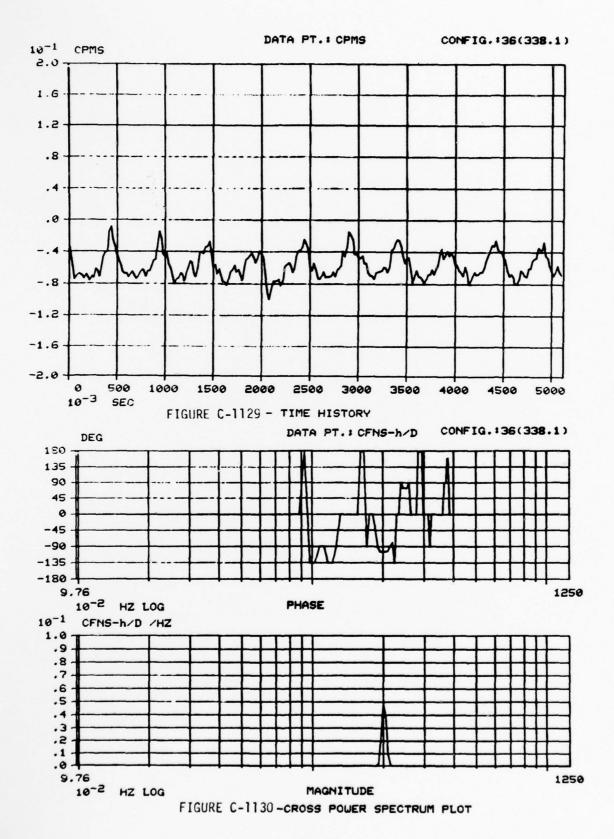


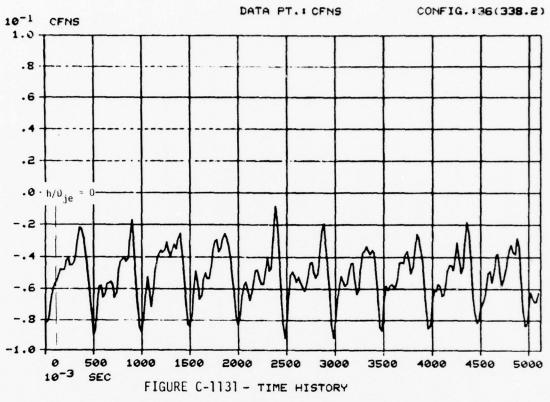
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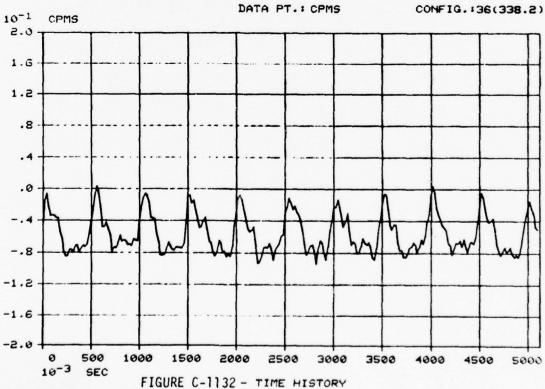


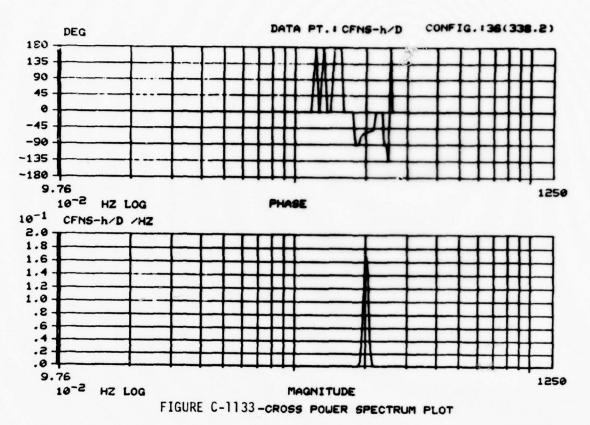
10-1 CFNS

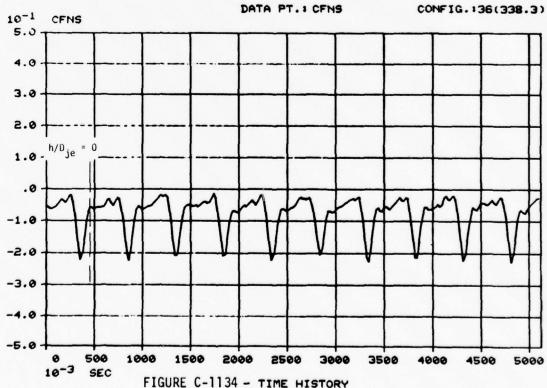
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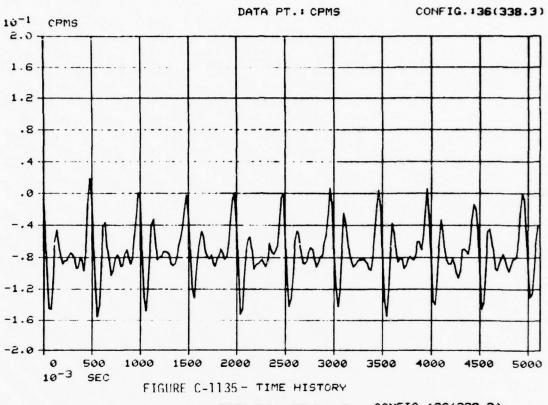












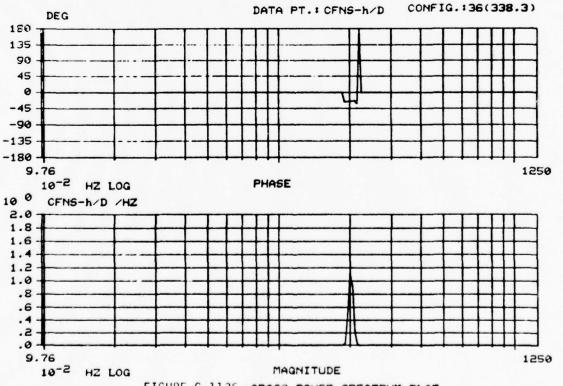


FIGURE C-1136 -cross POWER SPECTRUM PLOT

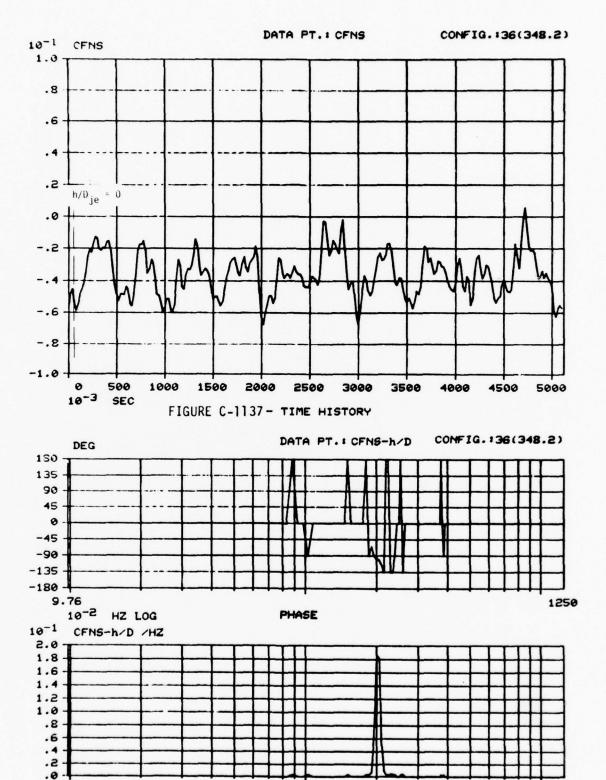


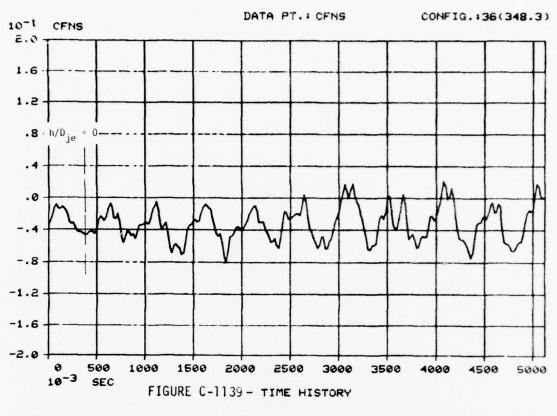
FIGURE C-1138 - cross POWER SPECTRUM PLOT

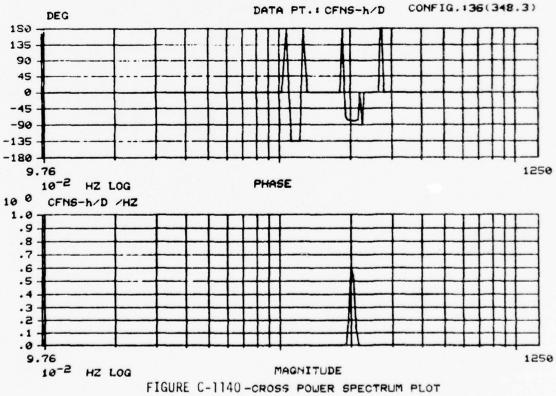
MAGNITUDE

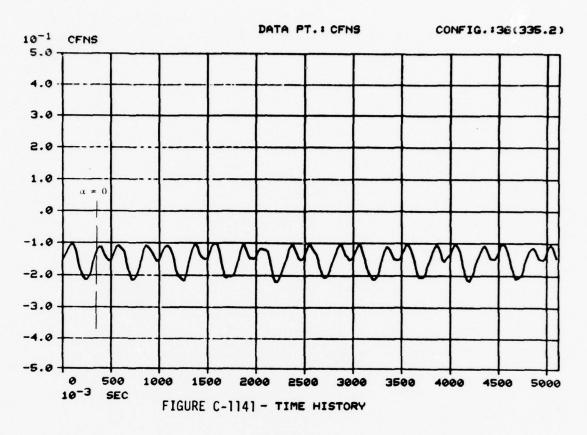
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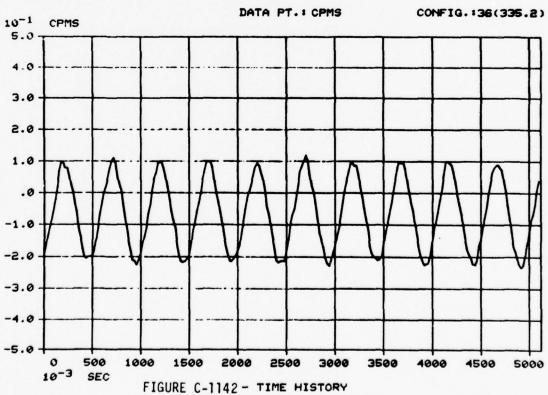
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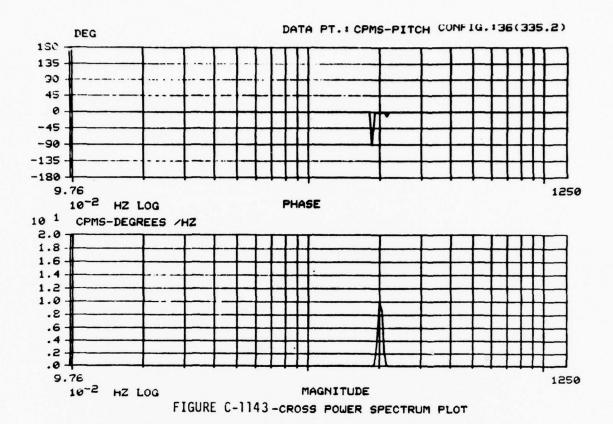
10-5 HZ LOG

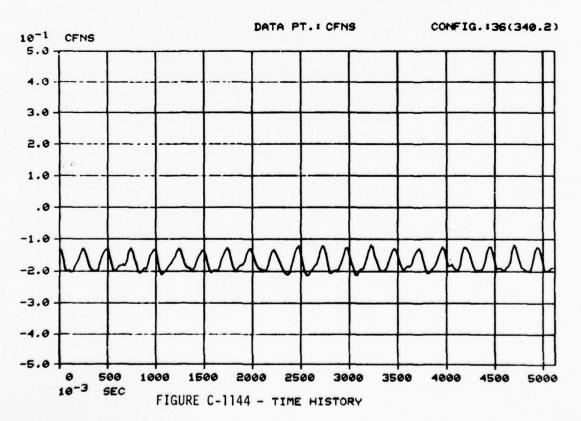


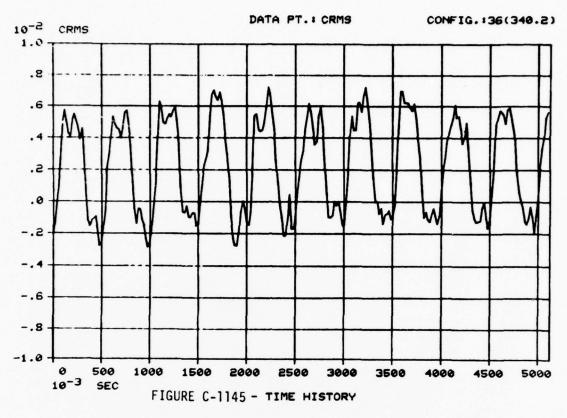












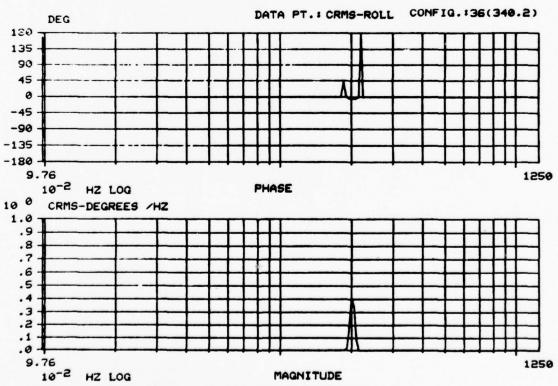
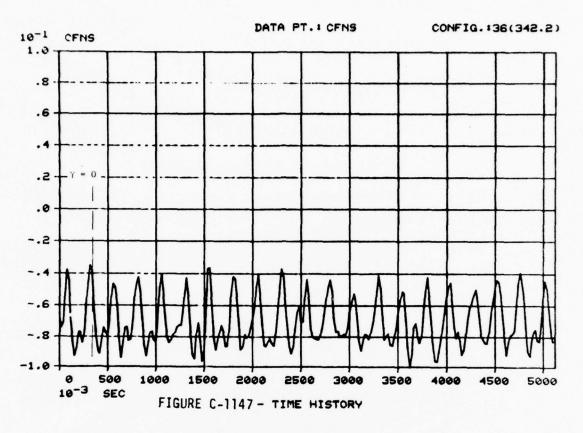
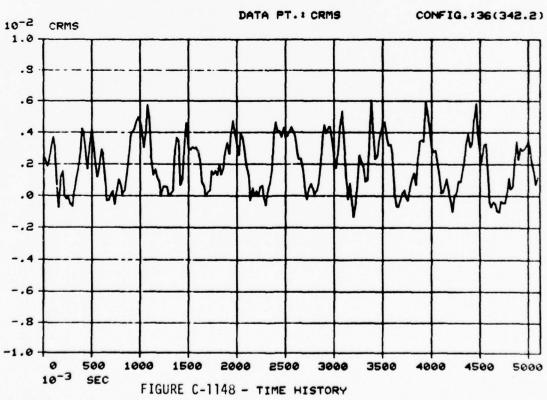
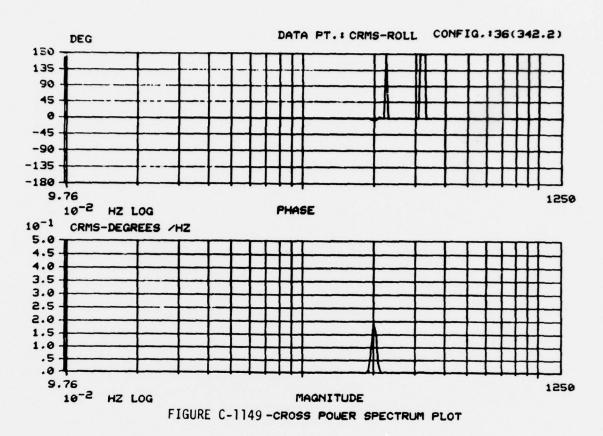
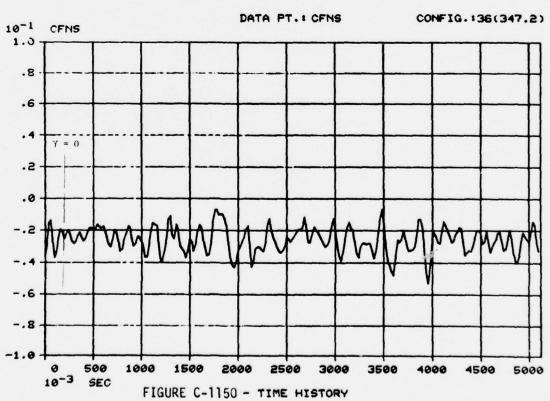


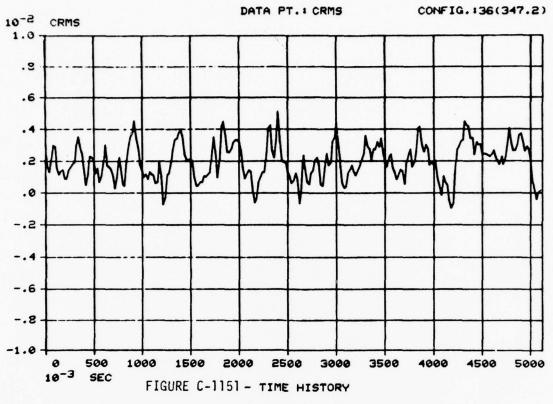
FIGURE C-1146 -CROSS POWER SPECTRUM PLOT











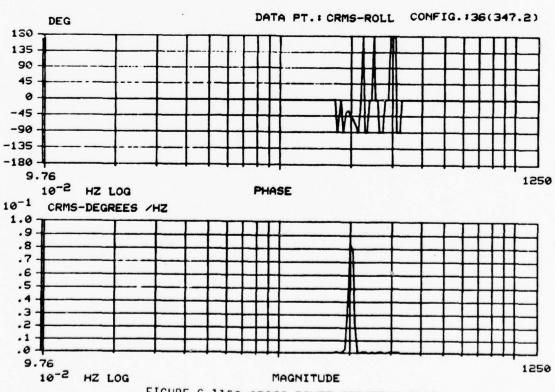
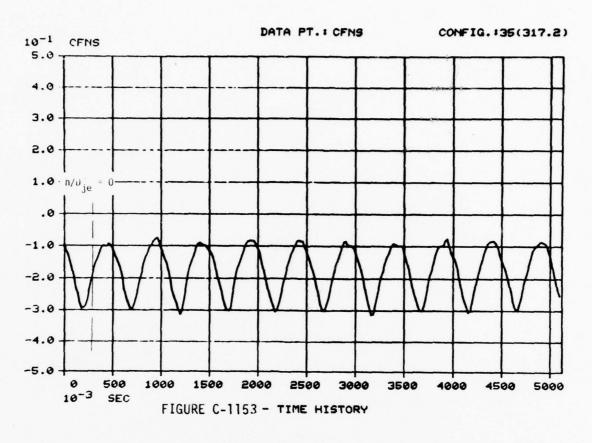
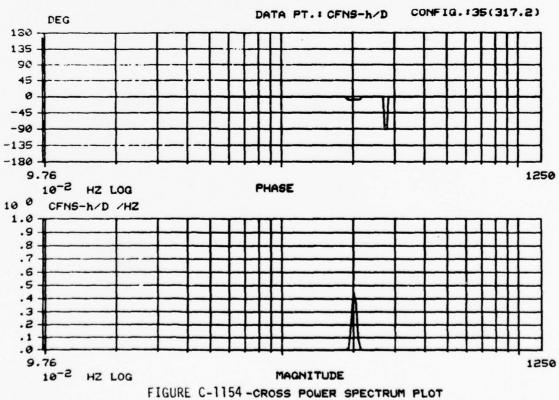
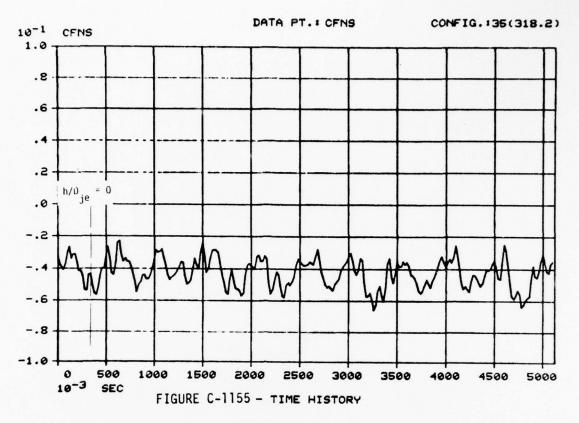
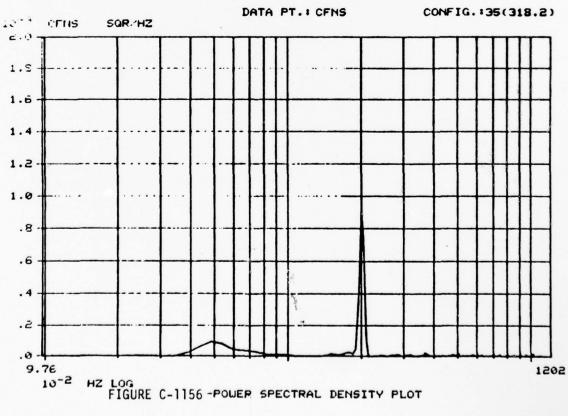


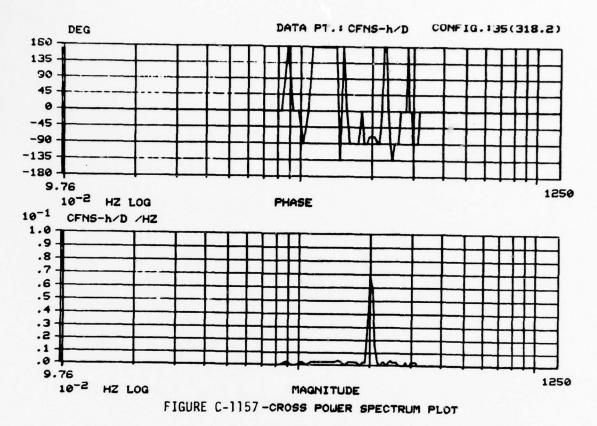
FIGURE C-1152-CROSS POWER SPECTRUM PLOT

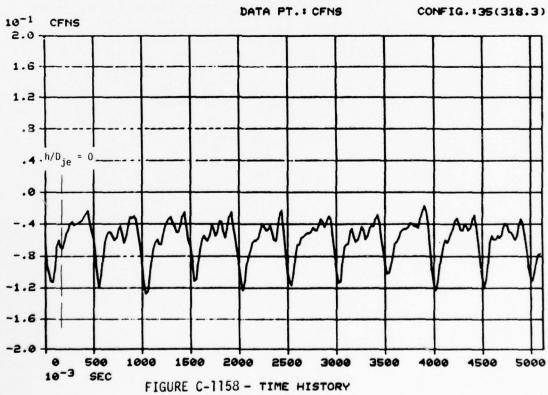


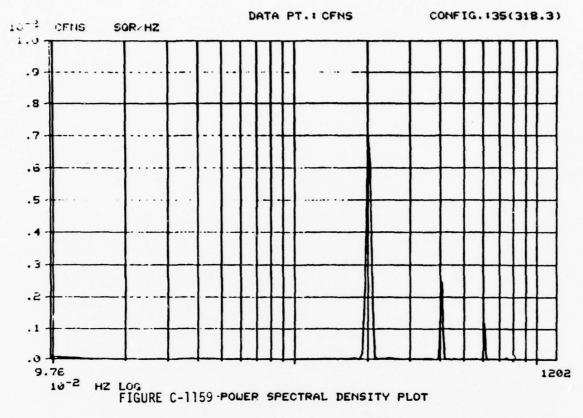


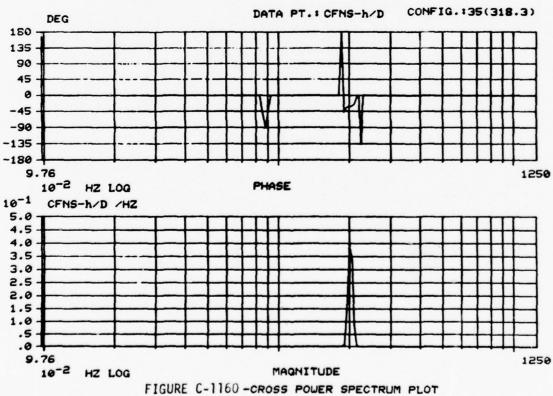


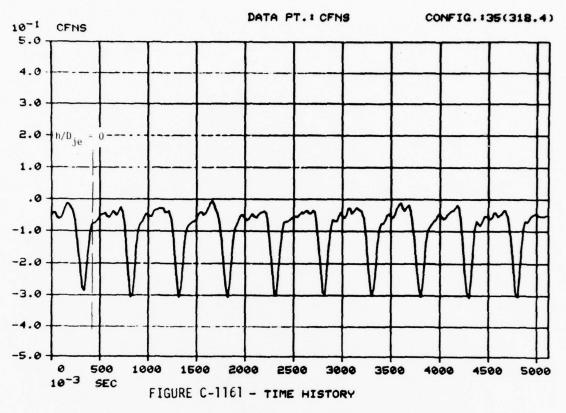


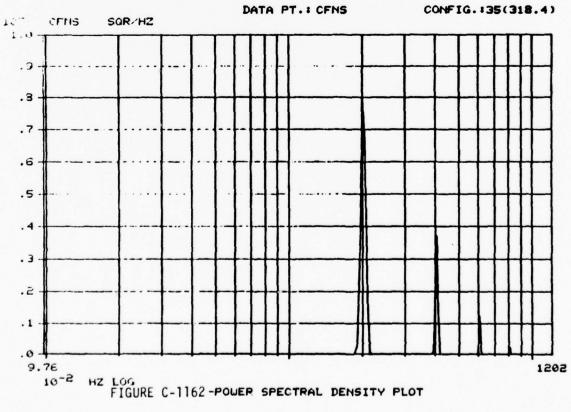


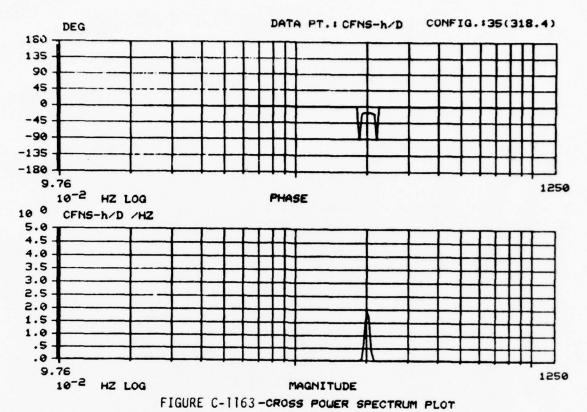




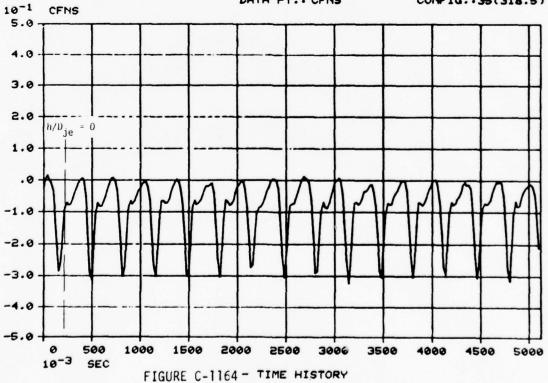


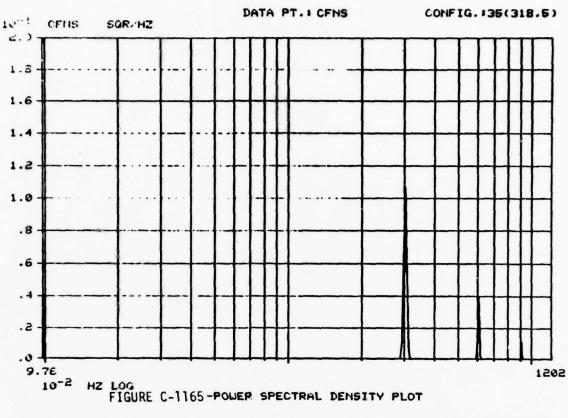


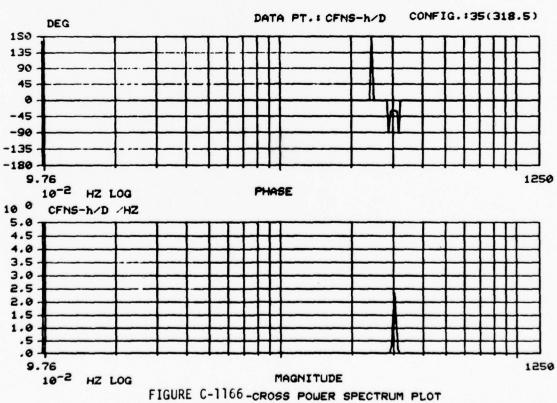


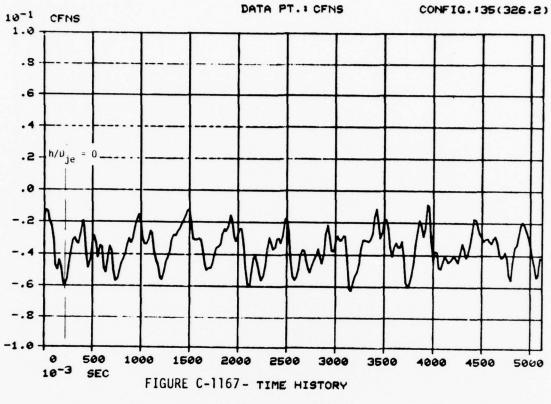


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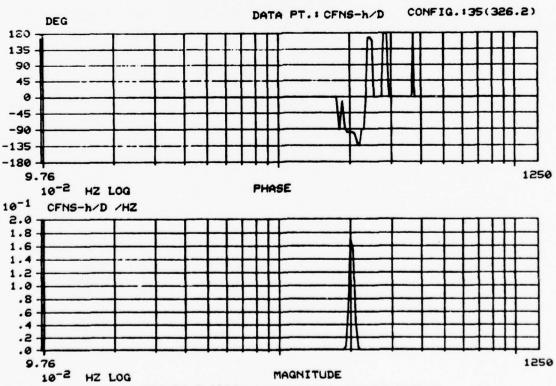
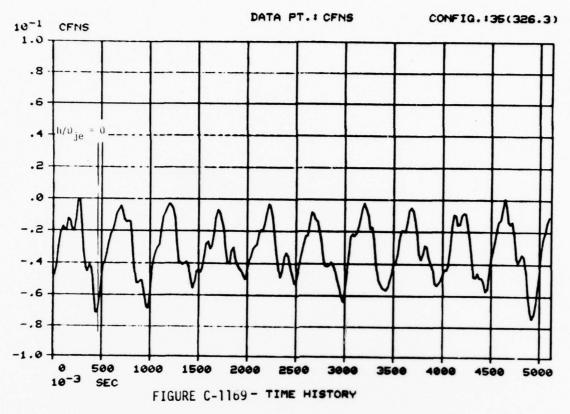
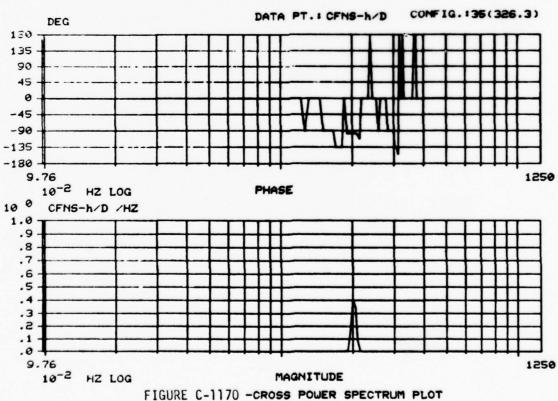
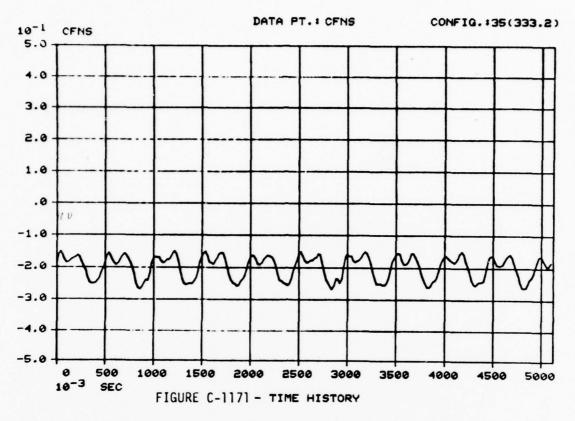
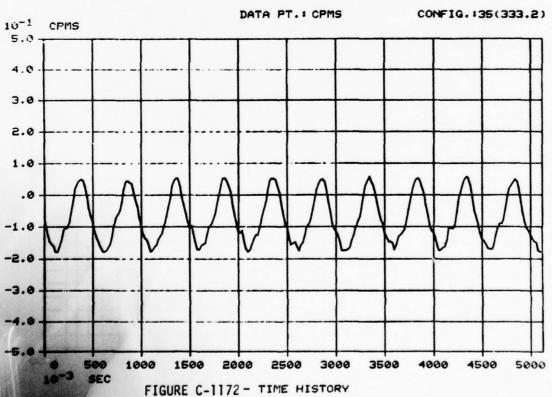


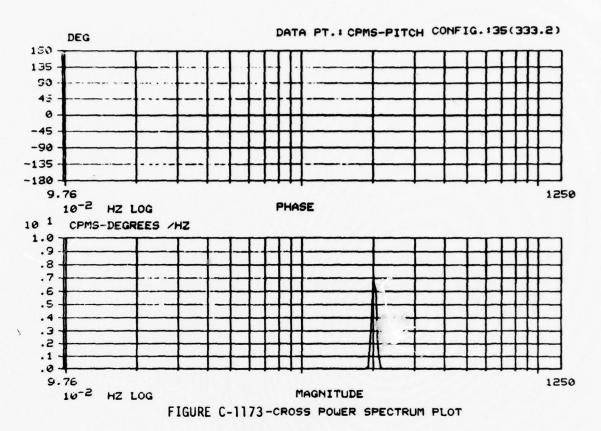
FIGURE C-1168 -cross POWER SPECTRUM PLOT

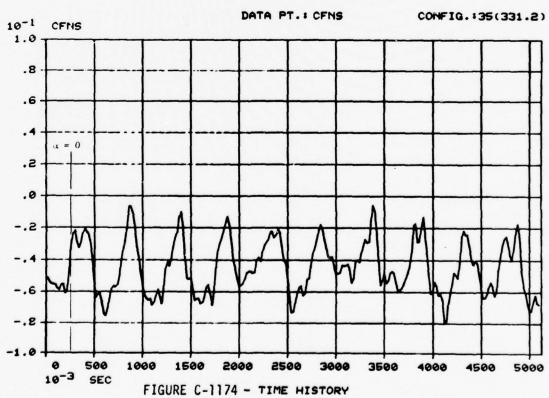


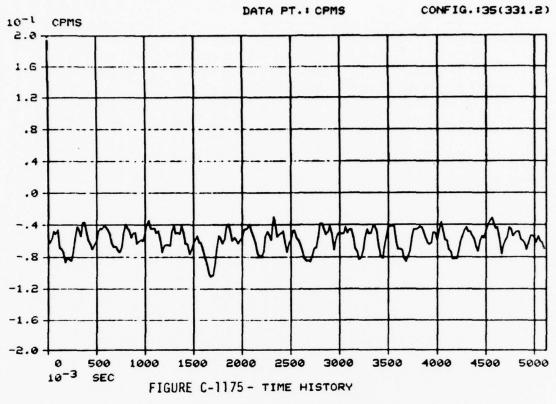












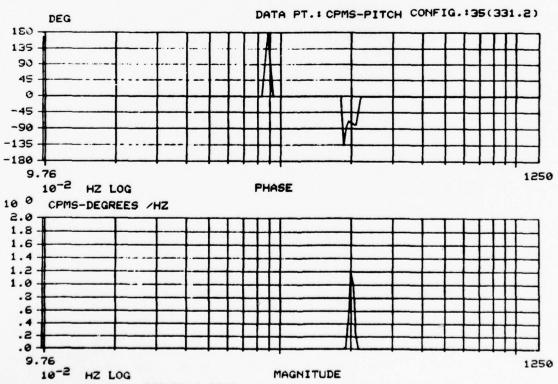
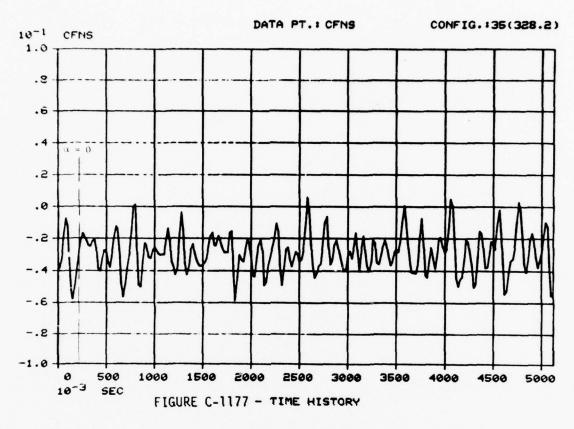
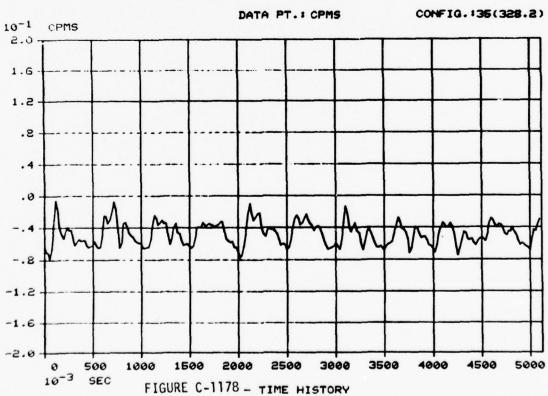
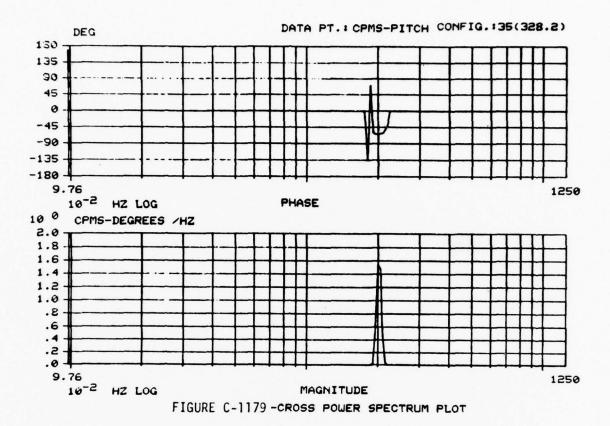
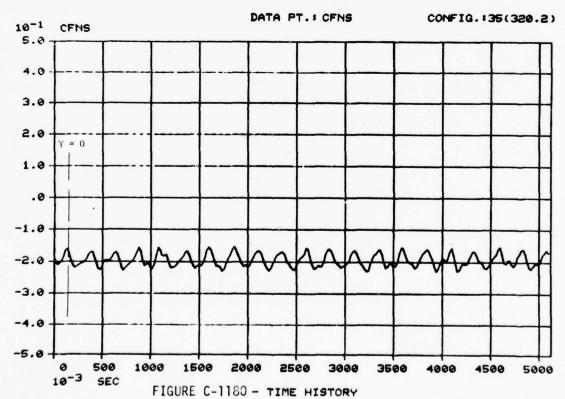


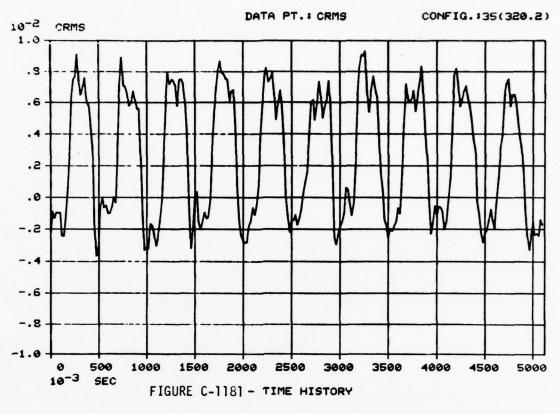
FIGURE C-1176 -cross power spectrum plot

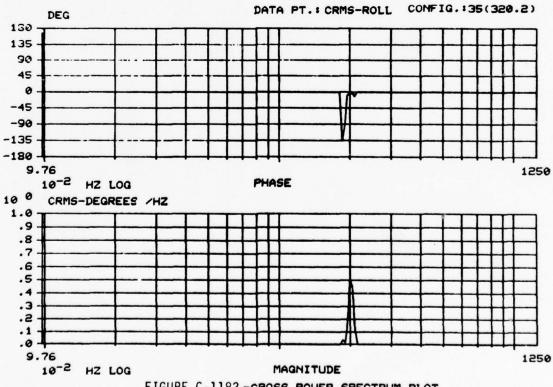


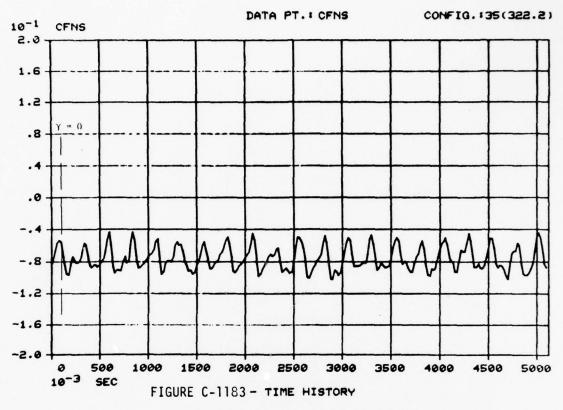


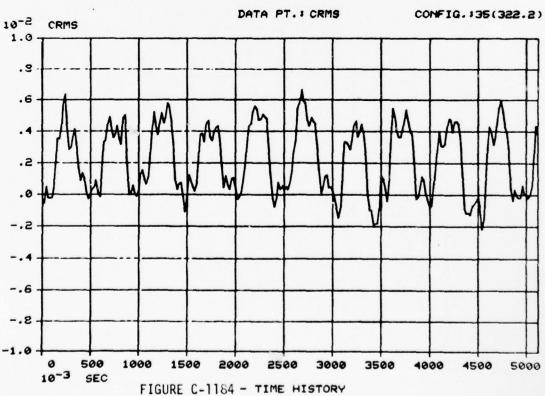


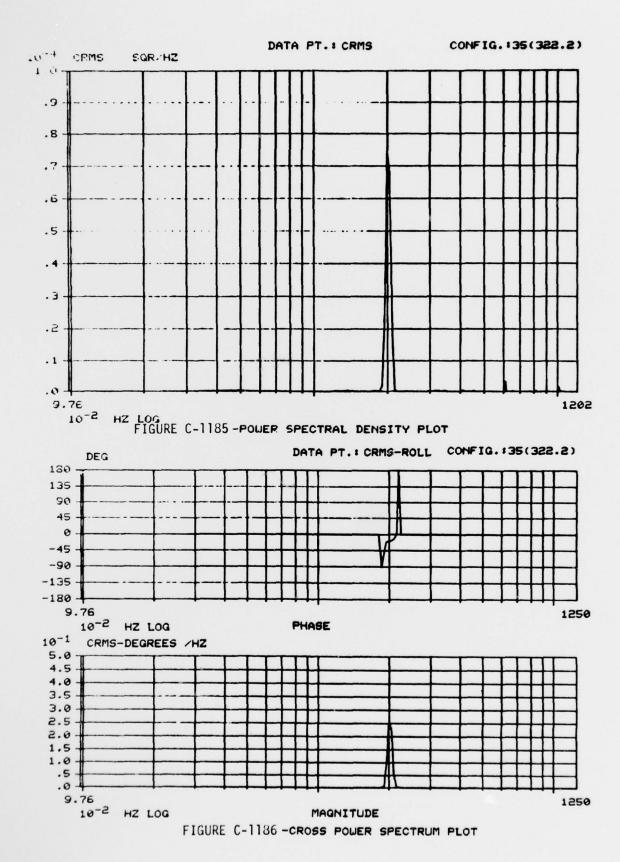


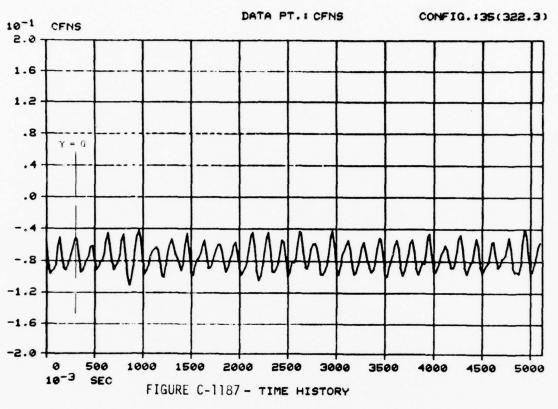


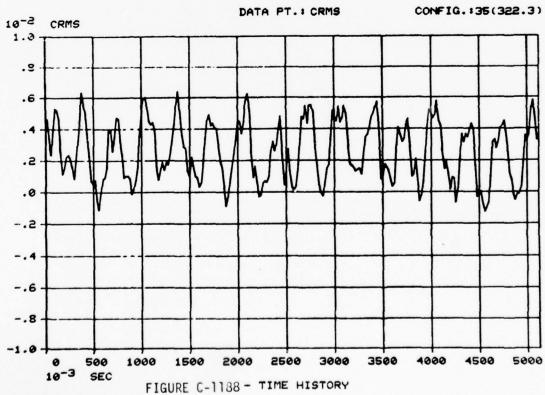


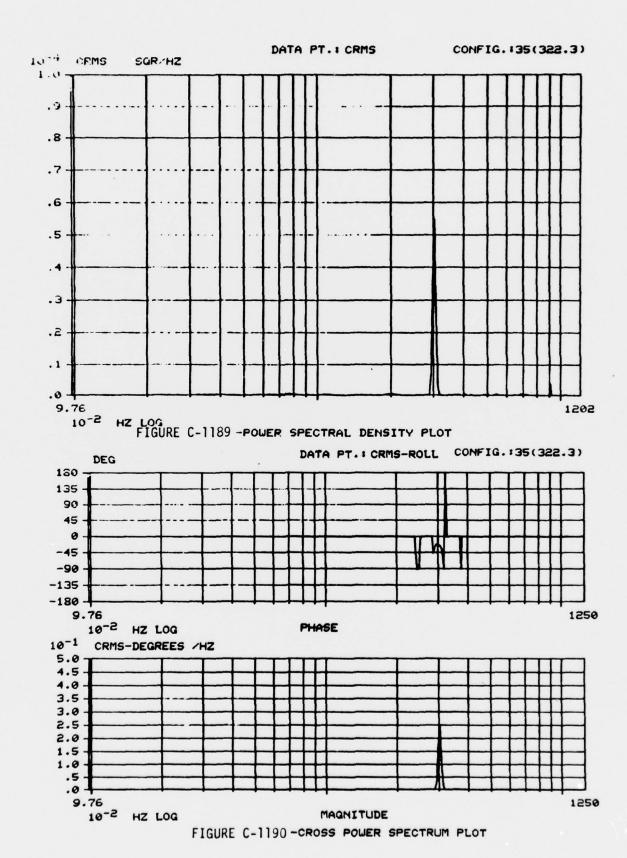


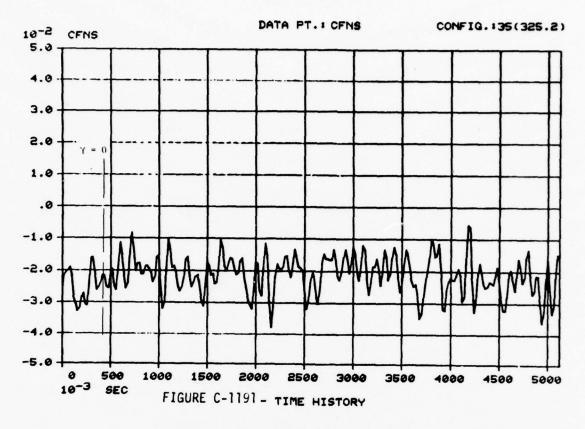


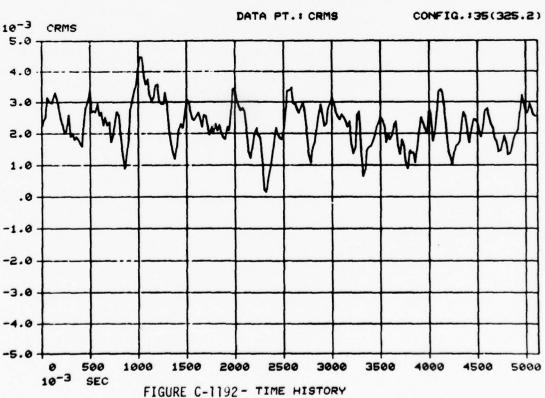


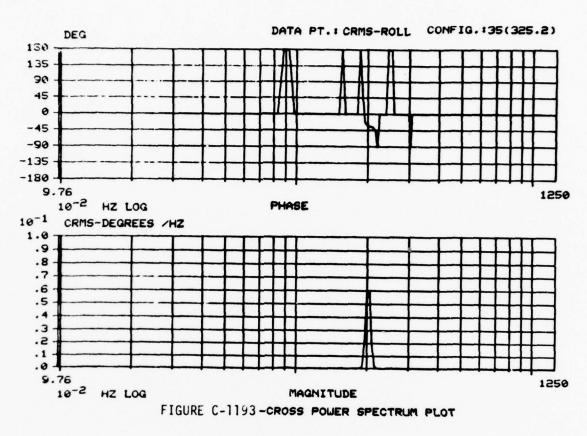


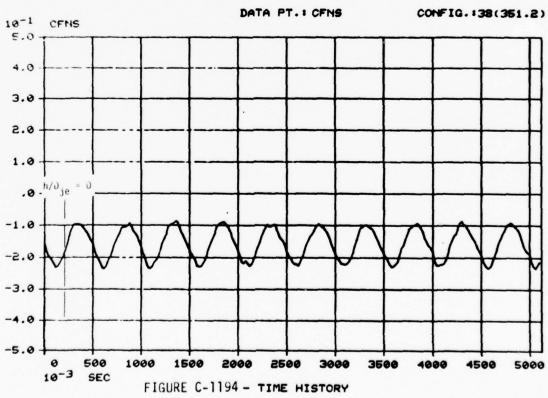


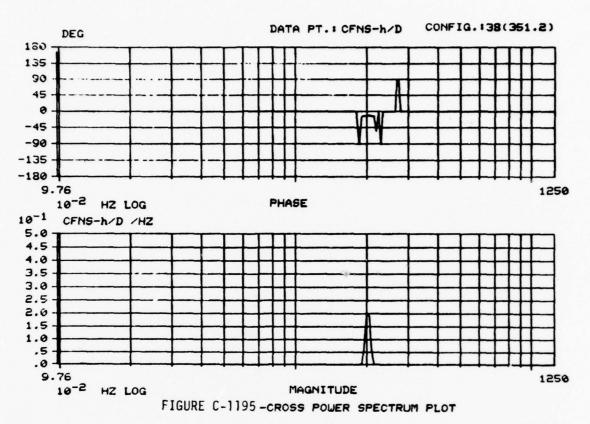


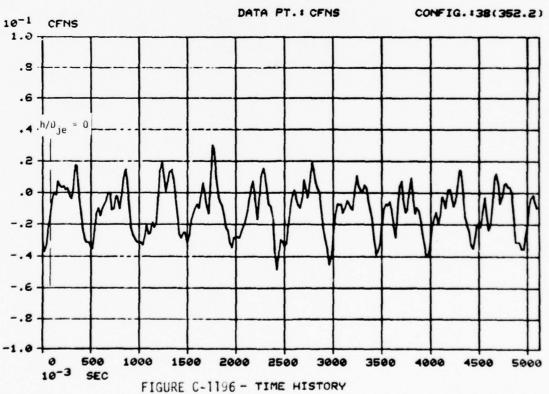


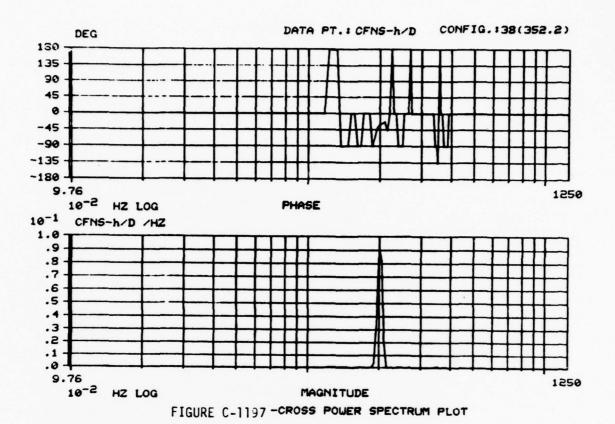




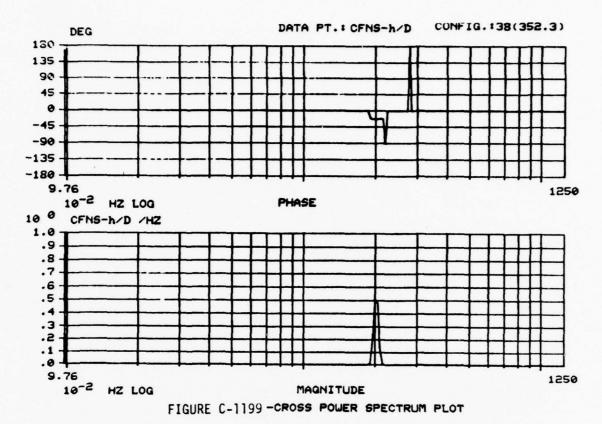


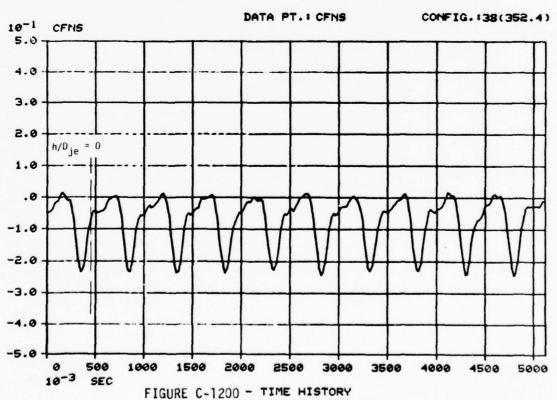


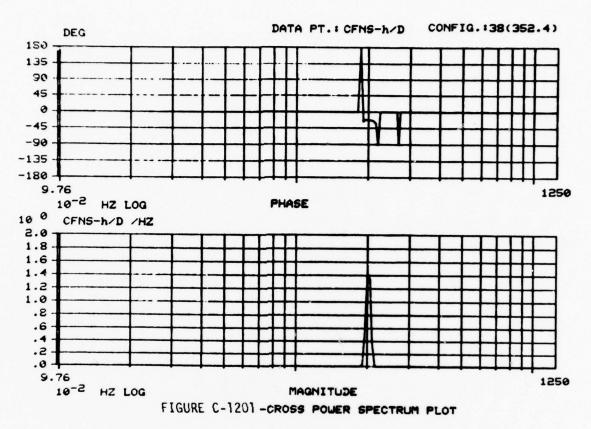


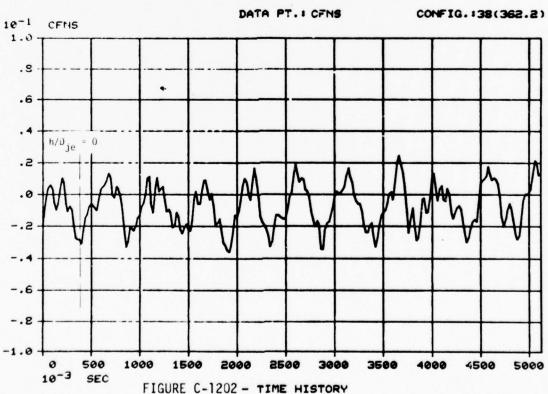


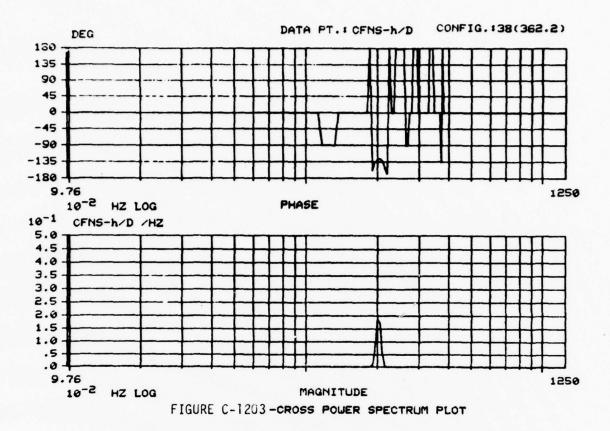
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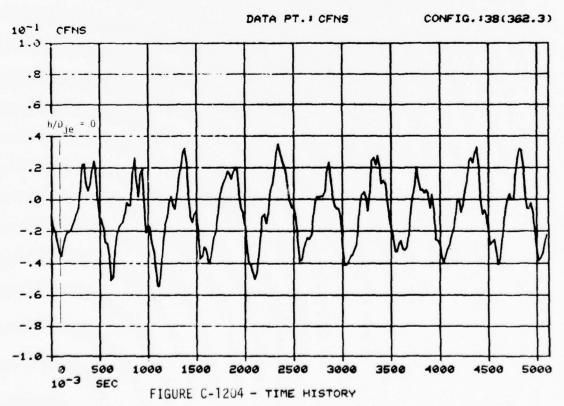


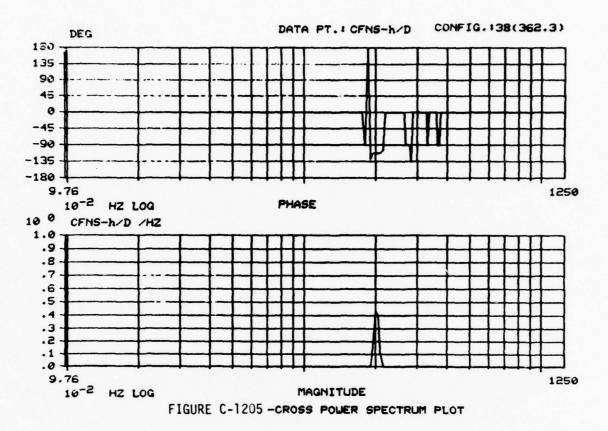


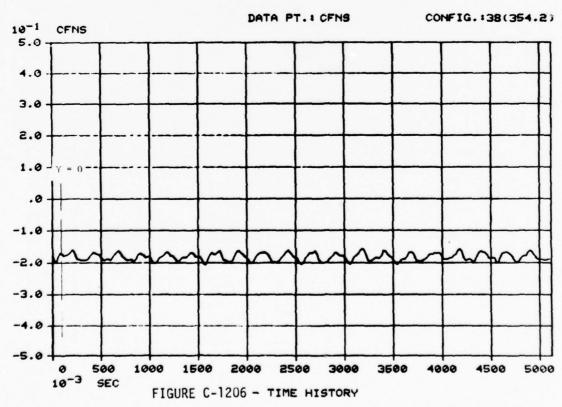


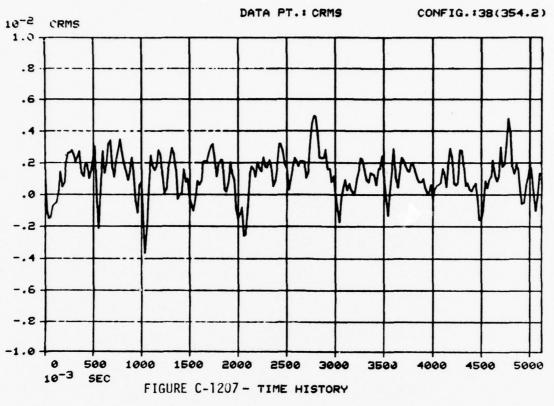


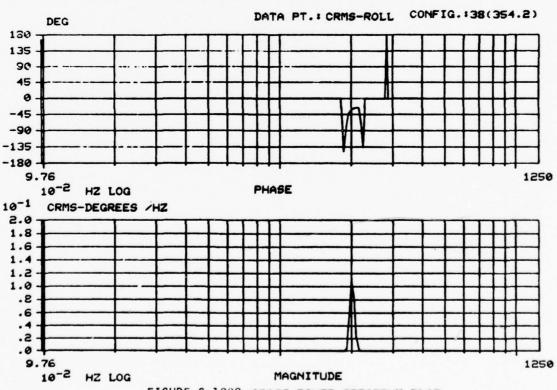


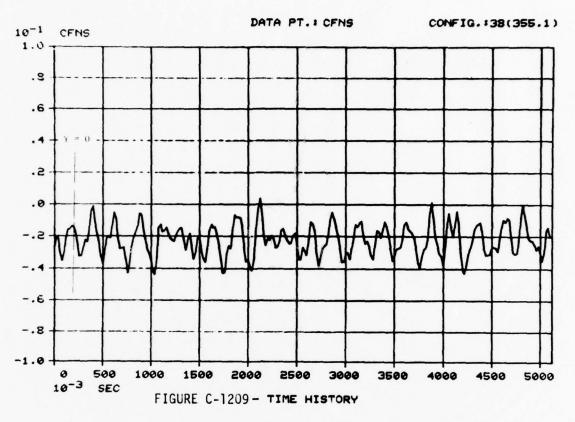


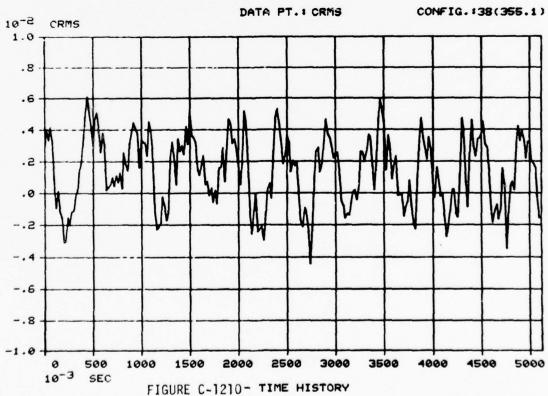


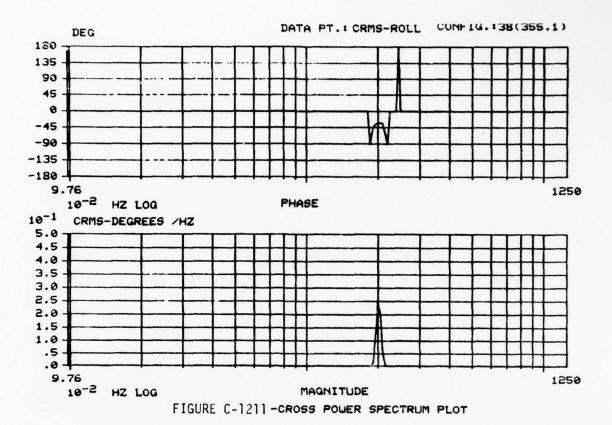


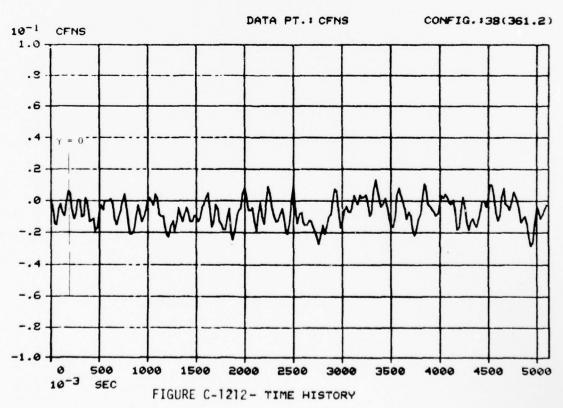


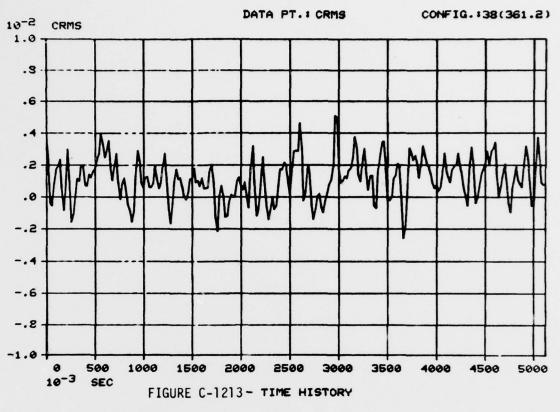












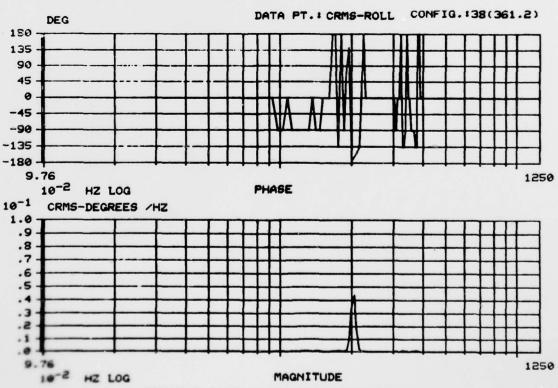
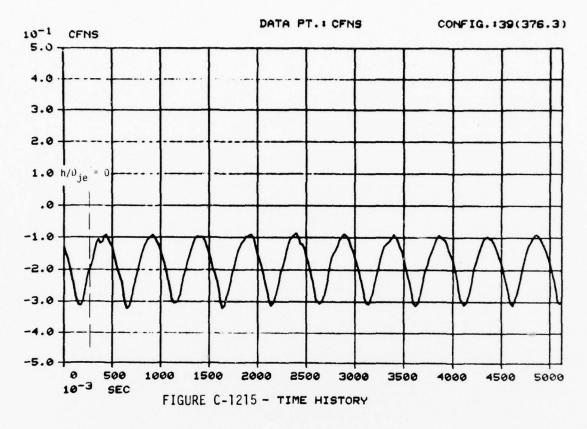
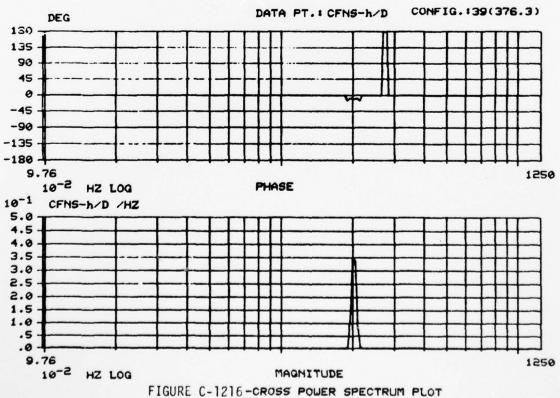
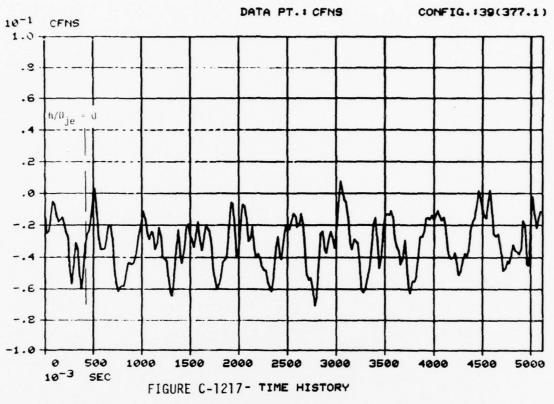
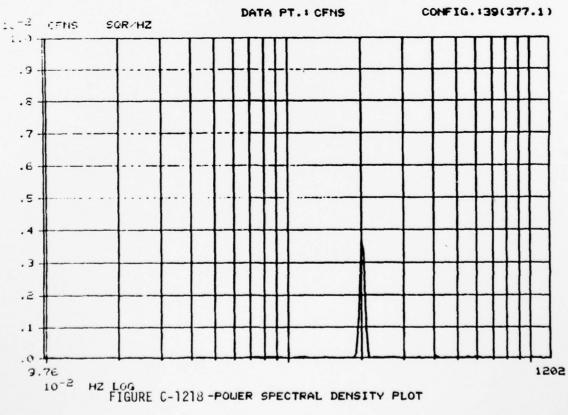


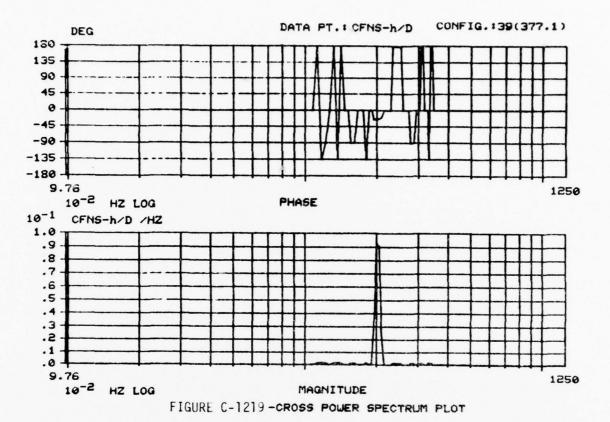
FIGURE C-1214 -CROSS POWER SPECTRUM PLOT

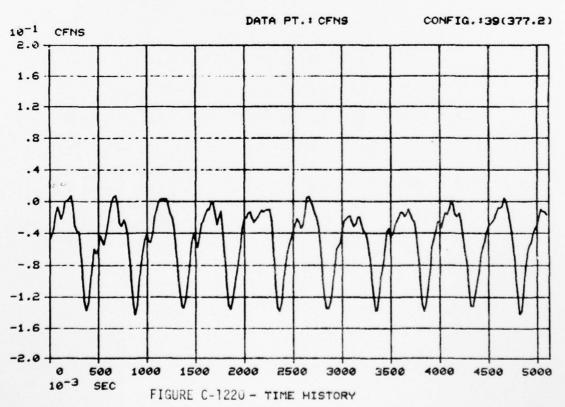


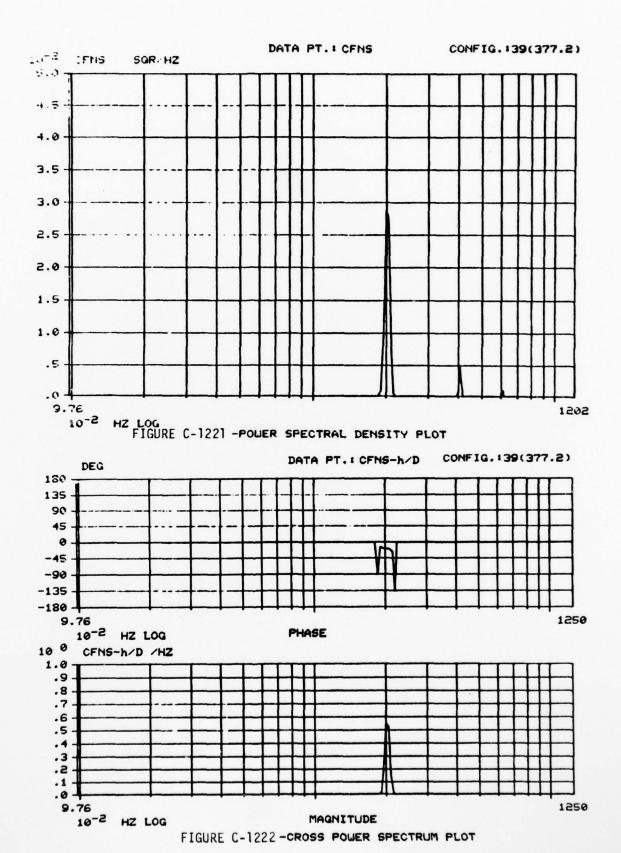


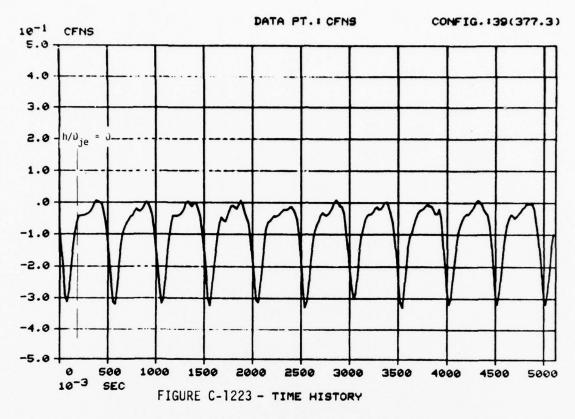


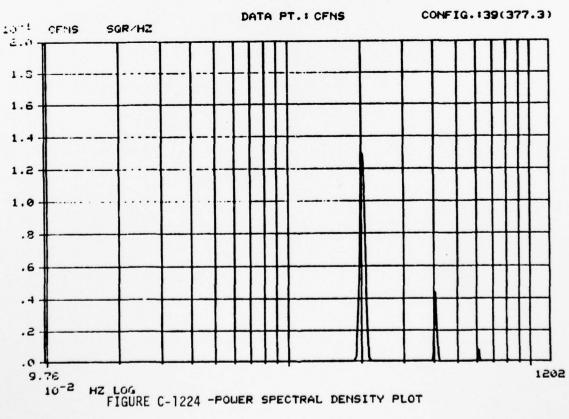


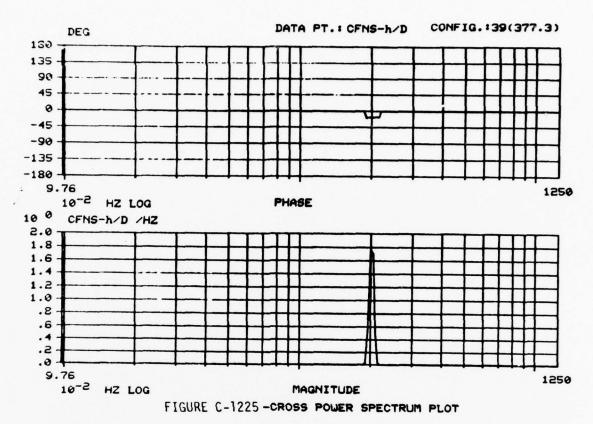


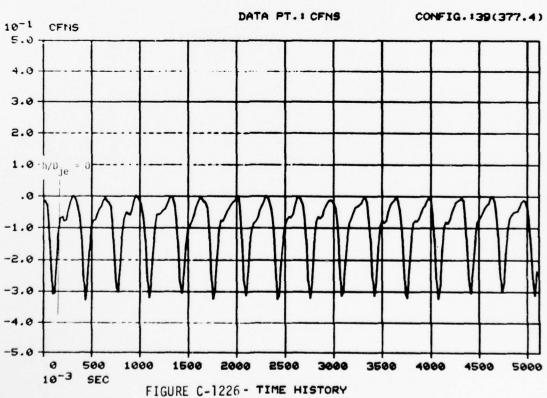


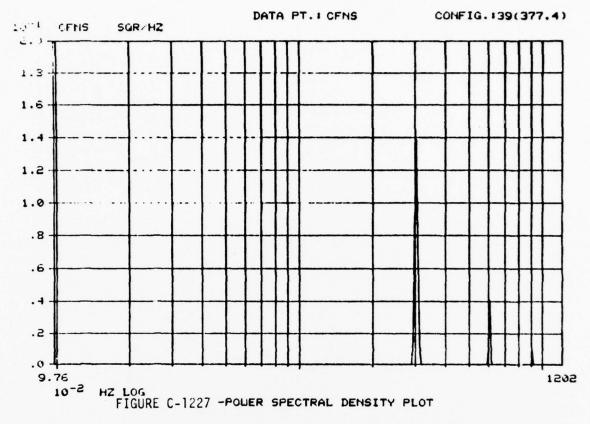


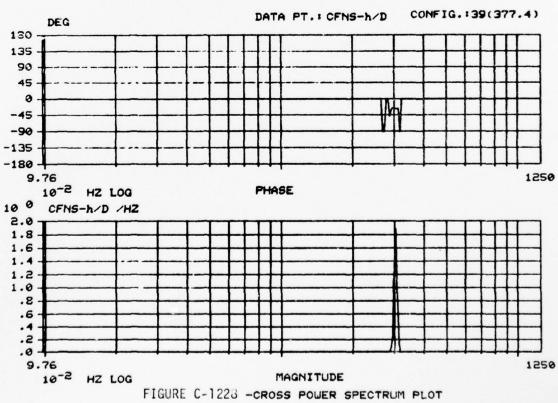


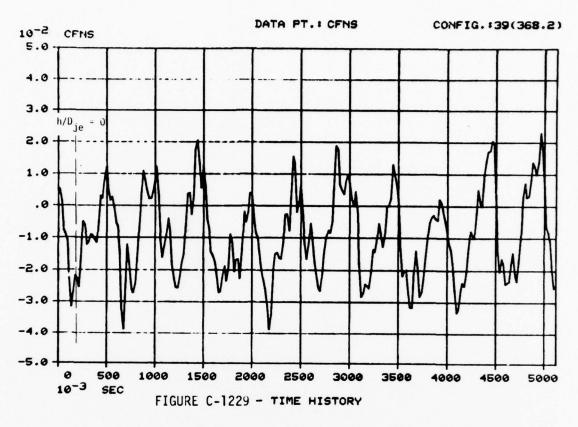


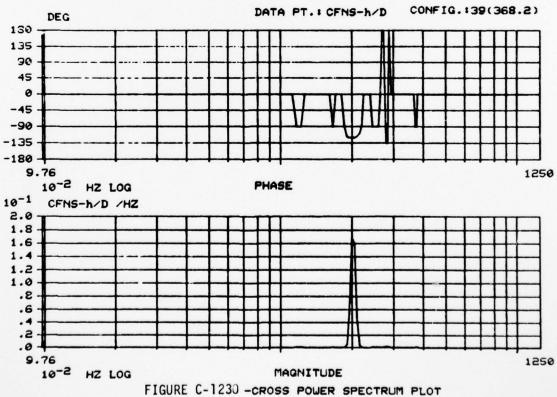


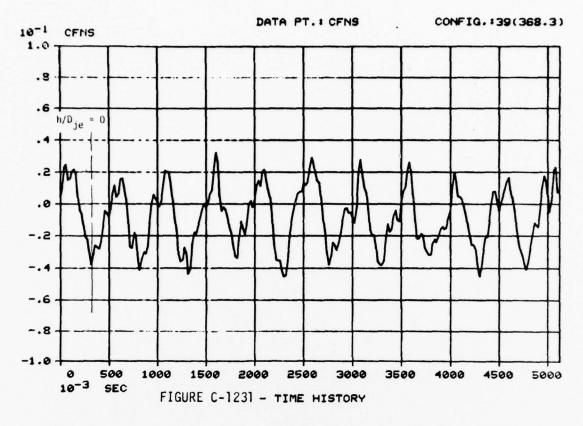


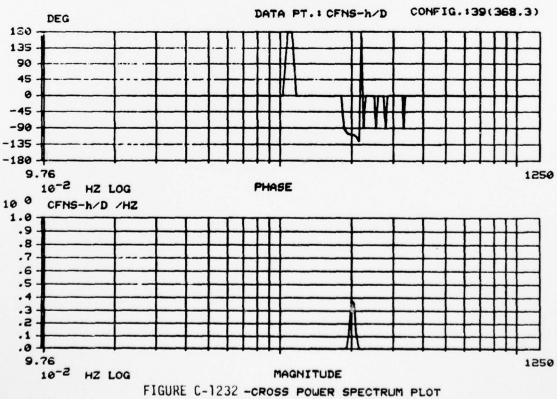


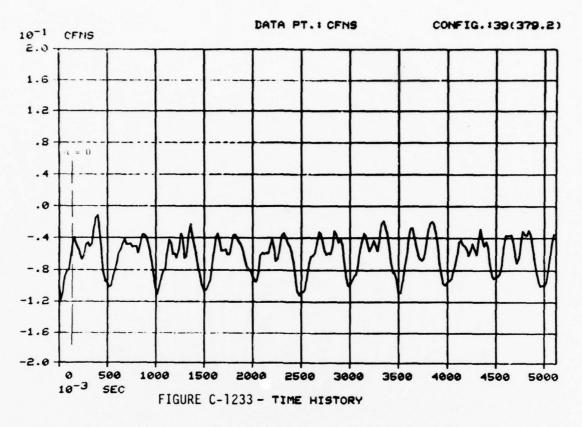


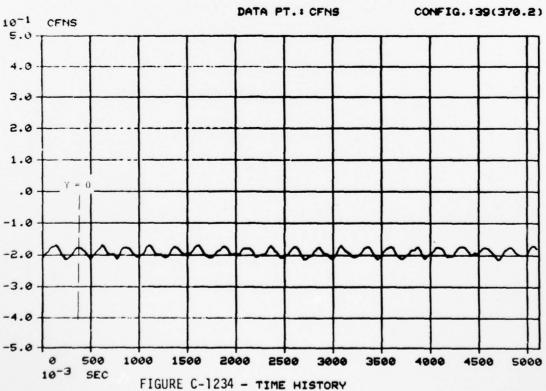


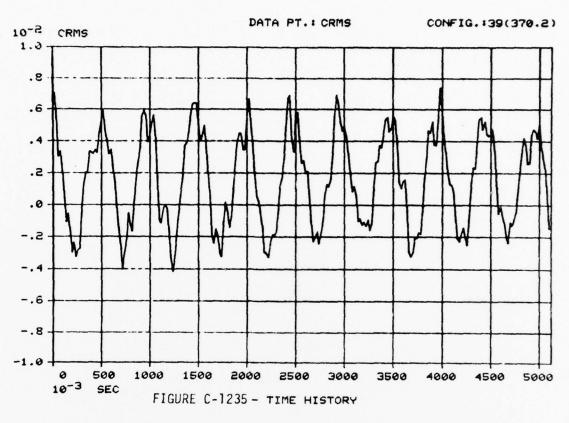


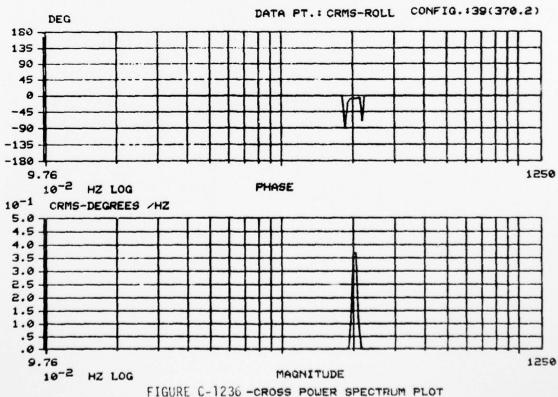


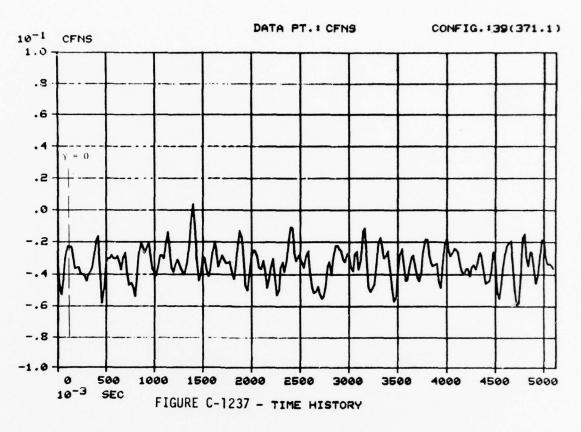


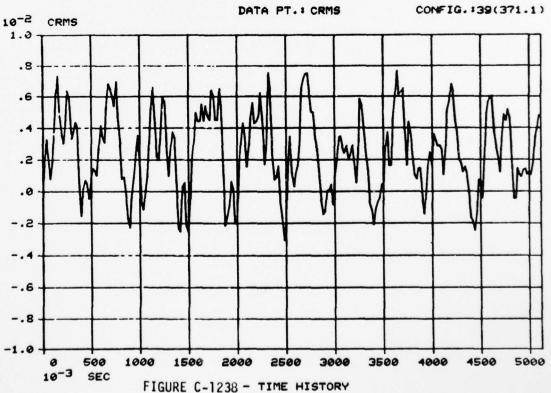


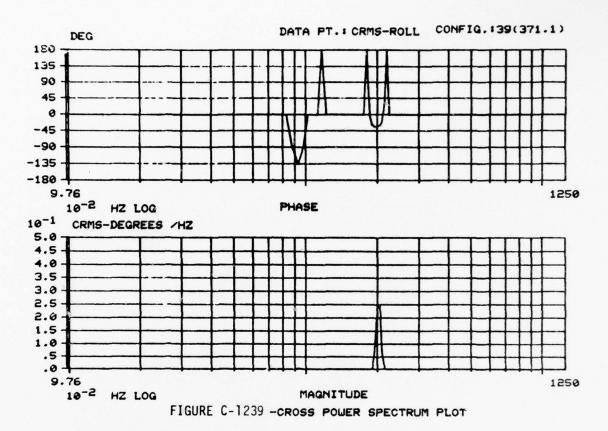


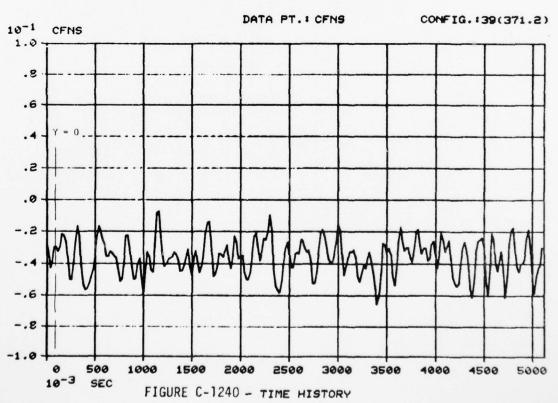












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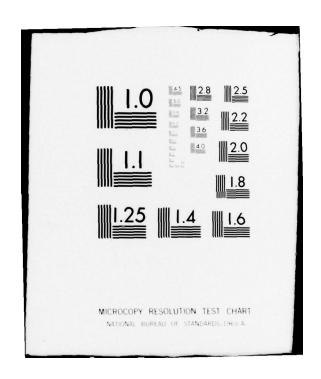


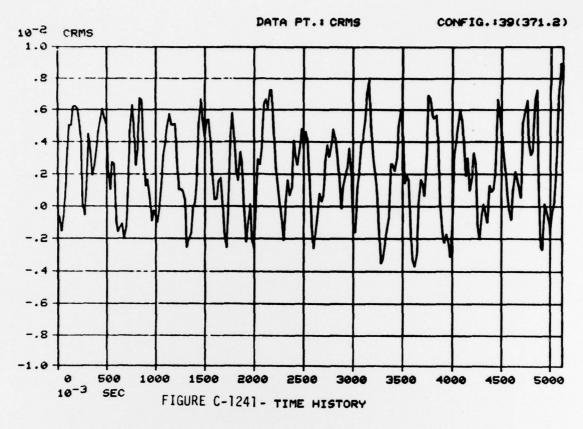


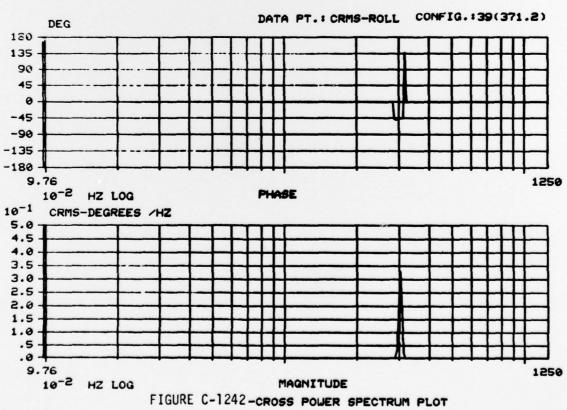


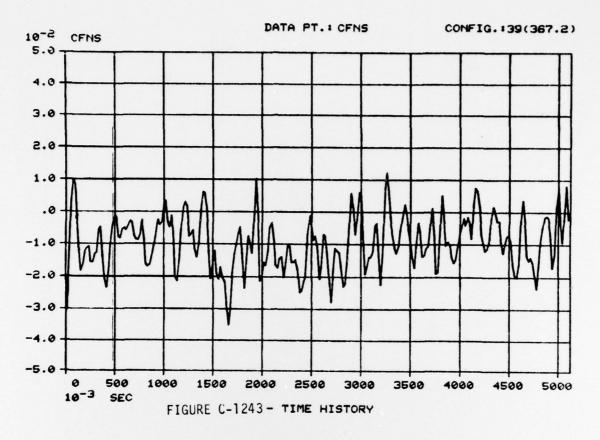


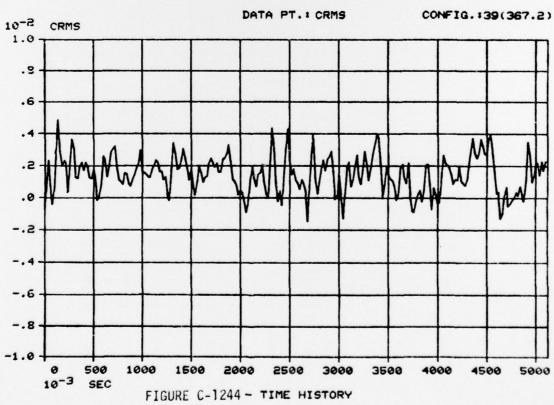
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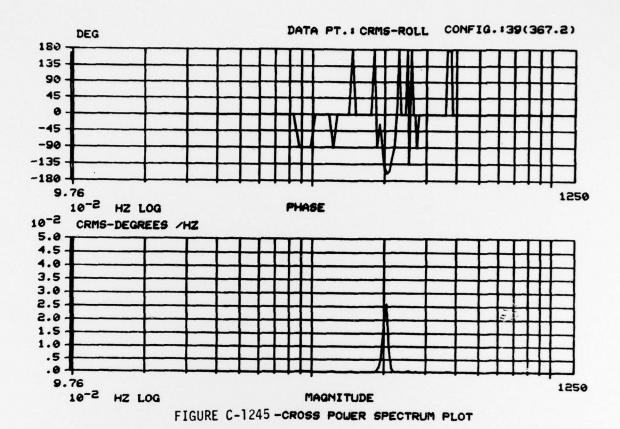












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